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Social Vulnerability in the Wake of 2010 BP Oil Spill: The Case of Southeast Louisiana

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SOCIAL VULNERABILITY IN THE WAKE OF 2010 BP OIL SPILL: THE CASE OF SOUTHEAST LOUISIANA

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Table of Contents

List of Tables

List of Figures

Abstract

The research presented in this dissertation assesses the social impacts of the 2010 BP Deepwater Horizon (BP-DH) oil spill in South Louisiana. The coastal region affected by this disaster is made up of rural communities whose residents rely on the Gulf of Mexico and its resources for their livelihoods. Understanding how this disaster has impacted the general quality of life in spill-affected communities, and how community characteristics have influenced vulnerability and resilience to negative outcomes, has important implications for basic and applied research and public policy. To examine these issues I use one-of-a-kind household survey data from the Community Oil Spill Survey (COSS) that includes a variety of measures indexing community sentiment, social vulnerability, physical health, mental health, disruptions to normal routines, economic impacts on households, and so forth. These data provide a novel opportunity to examine how the adaptive capacities of communities shape population wellness in a disaster context.

This study is grounded in literatures that emphasizes the role of emplaced local community conditions for shaping ways in which people experience and interpret hazards, risks and disasters. Specifically, I assess the social vulnerability of residents of coastal communities in Southeast Louisiana which were directly affected by the BP-DH oil spill. The aim of the project is threefold: 1) to identify the nature and extent to which the oil spill impacted residents' sentiment about their communities; 2) to investigate the variation in community level vulnerability and resilience in the wake of the disaster; and 3) to assess impacts to mental well-being tied to the loss of—or damage to—key resources upon which the victim is reliant.

Chapter 1: Introduction

The latter half of twentieth century has been described as a time of uncertainty, flux, and rapid social change (e.g. Bauman 2007; Brunsma and Picou 2008; Giddens 1991). The German sociologist Ulrich Beck defines the current situation as a “world risk society” in which the consequences of modernization have culminated in an ever-present condition of impending hazards and insecurities which have profound influences on everyday life (e.g., Beck 2000, 1999). From a theoretical standpoint, risk only arises in the presence of an event or activity that contains a degree of uncertainty. Adam and van Loon (2000:2) expand on this idea by asserting that “the essence of risk is not that it *is* happening, but that it *might* be happening” (original emphasis). Often risk is used synonymously with hazard, however *hazard* denotes “a potential threat” whereas *risk* is “the probability of a hazard occurring.” When the potential threat of a hazard is realized, a *disaster* begins to unfold, as was the case following the 2010 explosion and subsequent sinking of the BP-leased Deepwater Horizon (BP-DH) oil rig which touched off a sea-floor oil gusher that flowed unabated for several months.

The research presented in this dissertation assesses the social impacts of the BP-DH oil spill in South Louisiana. The coastal region affected by this disaster is made up of rural communities whose residents rely on the Gulf of Mexico and its bounties for their livelihoods. Understanding how this disaster has impacted the general quality of life in spill-affected communities, and how community characteristics have influenced vulnerability and resilience to negative outcomes, has important implications for basic and applied research and public policy. Specifically, to examine these issues I use one-of-a-kind household survey data from the Community Oil Spill Survey (COSS) that includes a variety of measures indexing community sentiment, social vulnerability, physical health, mental health, disruptions to normal routines, economic impacts on households, and so forth. These data provide a novel opportunity to examine how the adaptive capacities of communities shape population wellness in a disaster context.

This study is grounded in literatures that emphasizes the role of emplaced local community conditions for shaping ways in which people experience and interpret hazards, risks and disasters. In this study, I assess the social vulnerability of residents of coastal communities in Southeast Louisiana which were directly affected by the BP-DH oil spill. Specifically, the aim of the project is threefold: 1) to identify the nature and extent by which the oil spill impacted residents’ sentiment about their communities, 2) to investigate the variation in community level vulnerability and resilience in the wake of the disaster, and 3) to assess impacts to mental well-being tied to the loss of—or damage to—key resources upon which the victim is reliant. Taken together, the study will help to extend the literature on the sociology of disasters (e.g., Cope et al. 2013; Gill, Picou, and Ritchie 2012; Lee and Blanchard 2012; Picou, Marshall, and Gill 2004) as well as contribute to the greater understanding of disaster vulnerability is influenced by the social characteristics of people and places (e.g., Cutter 1996; Cutter, Boruff, and Shirley 2003; Norris et al. 2008).

1.1 Background and Overview

At approximately 9:45 on the evening of April 20, 2010, an explosion sent gas, oil and concrete up the wellbore of the BP-DH oil rig. Of the 126 people who were on board at the time, 11 perished in the explosion and an additional 17 workers required treatment for physical injuries (CNN Wire Staff 2010a). Fire spread across the platform, producing a glow which was visible from 35 miles away. Despite heroic efforts by the Coast Guard, at approximately 10:00 the morning of April 21—the fourteenth anniversary of Earth Day—the remains of Deepwater Horizon collapsed and sank (Breed and McGill 2010; CNN Wire Staff 2010b). The explosion and subsequent sinking of the rig led to a well leak that gushed oil into the Gulf of Mexico, at an approximate rate of 50,000 barrels a day, for nearly three months before being capped. With an estimated 5 million barrels of oil released into the Gulf of Mexico, the BP-DH spill now stands as the largest offshore oil spill in U.S. history (Robertson and Krauss 2010). Initial social impacts associated with the BP-DH disaster have been noted (e.g., Cope et al. 2013; Gill et al. 2012; Lee and Blanchard 2012) and will continue to unfold over time. The consideration of longitudinal impacts is important for the empirical study of disasters, because it reveals the disaster as an unfolding process, rather than an event tied to a specific singular point in time. As such, it is critical for sociologists to continue to identify how the BP-DH spill has impacted residents in the coastal regions of the Gulf of Mexico and ascertain the contours of the social landscape which bring about differential susceptibility to disaster related impacts.

With the Deepwater Horizon located approximately 50 miles offshore, the Louisiana region of the Gulf Coast, with a unique topography—that is neither land nor sea—constituting “an ever-thinning web of land and water” (Steffy 2011:207), was hardest hit by oil coming aground. One month into the disaster, Louisiana’s governor, Bobby Jindal, reported that more than 65 miles of shoreline had been contaminated and that crude oil was penetrating at least 12 miles into the state’s marshlands (Bluestein and Brown 2010). By June, 125 miles of Louisiana’s coastline had been oiled (Associated Press Business Staff 2010), with that number growing to 287 miles by July (Restore the Gulf.gov 2010) and 320 by November (Bowermaster 2010). In the years that followed, residual oil (e.g. tar balls) continued to pose long-term environmental effects (e.g., Kiruri, Dellinger and Lomnicki 2013; Operational Science Advisory Team 2011; Ososky et al. 2012). In late-August 2012, Hurricane Isaac made US-landfall in Louisiana, bringing ashore churned up oil from the BP-DH spill (Burdeau 2012). As of June 2013, active cleanup operations had concluded in all Gulf Coast states except Louisiana, where 84 miles of shoreline remained sullied (Associated Press 2013). Nearly four years since the onset of the disaster, on April 15, 2014 with much fanfare BP announced an end to active shoreline cleanup; however, the US Coast Guard was quick to point out that there was still cleanup work to be completed and reassured gulf coast residents that operations would continue (Robertson and Scheartz 2014).

Southeast Louisiana has been the site of many large-scale disasters. In August 2005, 5 years prior to the BP-DH spill, Hurricane Katrina made landfall near the Louisiana-Mississippi state border. Katrina produced a storm surge which precipitated a catastrophic failure of the levee system protecting New Orleans. The widespread flooding that followed the breaching of the New Orleans levee system now ranks among the greatest disasters in the nation’s history (Knabb, Rhome and Brown 2005). In the wake of Katrina, the nation’s media outlets were attuned to the tragedy that was unfolding in New Orleans, albeit giving considerable less attention to small rural areas and towns which were home to thousands of storm affected inhabitants (Saenz and Peacock 2006), Indeed, many of these communities were still very much engaged in the rebuilding and recovery process from Katrina when the BP-DH disaster began to unfold in April 2010.

Socially, contemporary Southeast Louisiana is economically underpinned by participation in two major offshore activities: 1) the oil and gas industry, and 2) the fishing and seafood industry. In this region, both major offshore activities have a long history of coexistence and mutual support (Freudenburg and Gramling 2011). For example, the fishing industry utilizes the offshore oil rigs as a key fishery habitat, while the oil and gas industry utilizes the maritime capacity of the fishing industry for transport activities. These two sectors of the economy combined stand as a mooring for residential activity and identity (e.g., Comeaux 1972; Davis 1990; Freudenburg et al. 2009; Henry and Bankston 2002). Accordingly, as the BP-DH technological disaster slowly unfolded over the summer of 2010, disruptions reverberated throughout the region. Almost immediately, impacts were felt in the fishing and seafood industry as much of the Gulf of Mexico faced emergency closures. Additional shocks were experienced in the Gulf as a six-month moratorium on deepwater drilling was imposed by the Obama administration on May 27 (the moratorium was set forth by Secretary of the Interior Ken Salazar in 30 C.F.R. 250.172(b) – (c)). However, on June 22 the drilling moratorium faced a court imposed injunction (*see Hornbeck Offshore Services LLC* v. *Salazar)*. On July 12, Salazar issued a decision memorandum calling for narrower suspensions of deepwater drilling; specifically targeting safety concerns associated with deepwater wells which used a blowout preventer—these suspensions were intended to last until November 30, but ultimately were lifted ahead of schedule on October 12. Additional shockwaves were felt in the region when on December 1, the Obama administration announced a seven year ban on exploration and drilling possibilities in the eastern Gulf, effectively reversing plans which had been announced only weeks prior to the commencement of the BP-DH disaster (CNN Wire Staff 2010c).

In the wake of the BP-DH oil spill, it is incumbent on social scientists to identify how the spill has impacted the people who live in the coastal region and to determine the contours of differential impacts across the social landscape. To date, social scientists have begun to examine issues such as, for example, mental and physical well-being (e.g., Cope et al. 2013; Lee and Blanchard 2012), shifts in environmental views (e.g., Hamilton, Stafford, and Ulrich 2012); community resilience (e.g., Colten, Hay, and Giancarlo 2012), how changes to the environment will influence the outlook of children (Gavenus, Tobin-Gurley, and Peek 2013), risk perception (e.g., Campbell, Bevc, and Picou 2013), and public relations and image restoration strategies employed by BP which "did not attempt to shift the blame onto other companies nor admit responsibility on their own part" (Harlow, Brantly, and Harlow 2010: 82). The three articles that make up this dissertation add to this growing body of literature.

The first article, "Crude on the Bayou," addresses the nature and extent to which the oil spill impacted residents' sentiment about their communities. Scholars have argued that disasters should be conceptualized as a time-laden social process rather than as a singular event (e.g., Chhotray and Few 2012; Picou et al. 2004; Quarantelli 2005; Saenz and Peacock 2006). As a social process, the ways a community responds to catastrophic disruption tend to differ insofar as the disaster process is viewed as 'natural' or 'man-made' (e.g., Freudenburg 2000, 1997, 1993 see also; Gill and Picou 1998; Kroll-Smith and Couch 1990; Tierney 2007). In a context with a natural disaster catalyst, it is argued that a "therapeutic community" is likely to emerge as people exhibit a high level of cohesiveness by providing mutual aid in response and recovery efforts. Conversely, technological disasters are said to bring about a community response rife with divisions and conflict. Such responses have been referred to as a "corrosive community." In this article, I utilize unique repeated cross-sectional household survey data to examine the social impacts of the 2010 BP-DH oil spill. Specifically, I analyze four waves of the COSS collected between

2010 and 2013 to explore the nature and extent of how community attitudes and sentiments were impacted by the disaster. In doing so, my analysis aims to contribute to the sociological literature on disaster-related community disruption, with a key contribution being the simultaneous consideration of two leading approaches to conceptualizing community attitudes and sentiment: the systemic model of community and the corrosive community framework.

The second article is titled "Emplaced Social Vulnerability to Technological Disasters," In this article, I investigate variation in community level vulnerability and resilience in the wake of the disaster. Specifically, I examine the relationship between emplaced social vulnerability and impacts on mental health following the BP-DH oil spill. Analysts have argued that disaster vulnerability is socially constructed, arising out of the economic and social conditions of everyday life (e.g., Cutter et al. 2003; Myers, Slack, and Singelmann 2008; Norris et al. 2008; Wisner et al. 2004). As such, policy makers, emergency planners, and response organizations are encouraged to identify high risk communities for the purpose of aggressively developing effective disaster management strategies. Through joint analysis of data from the COSS and U.S. Census Bureau products, I develop a place-based index of social vulnerability to examine how emplaced characteristics engender unique susceptibility to the BP-DH disaster, with a special focus on the influence of natural resource employment and community sentiment. I document that negative mental health impacts were more pronounced at baseline compared to later time points, and that emplaced social vulnerability influences this shift. The results confirm that vulnerability is a multidimensional concept and highlights that susceptibility to disaster related disruptions is influenced by the social characteristics of people and places.

The third and final article, "Never Confuse a Single Impact with a Uniform Impact," assesses impacts to mental well-being associated with resource loss and natural resource employment. There is a long established relationship between experiencing a disaster and associated impacts to individual mental well-being (e.g., Arata et al. 2000; Beiser, Wiwa, and Adebajo 2010; Lee and Blanchard 2012; Norris et al. 2008). For example, mental anguish may be tied to the loss of—or damage to—key resources upon which the victim is reliant. In such cases, individual response to and recovery from a disaster is an interpretive processes influenced by the community's relationship to that environment and the manner in which damage was inflicted on the environment. In this article, I use four waves of the COSS collected between 2010 and 2013, to examine the impacts of the BP-DH oil spill on mental health among spill affected residents in Southeast Louisiana. Further, in light of direct impacts faced by populations with ties to the oil/gas and fishing/seafood industries, and the important role such occupations have for the cultural and economic identities of residents of the region, I pay particular attention how sociocultural and psychosocial ties to these industries promotes a unique vulnerability to mental health impacts (see e.g. Dyer, Gill, and Picou 1992; Flint and Luloff 2005; Kroll-Smith and Couch 1993, 1991). Collectively, by addressing such issues, this article extends the general sociology of disaster literature and contributes to a greater understanding of the patterns of vulnerability and resilience associated with technological disasters.

Taken together, these three articles provide an empirical and theoretical assessment of how the BP-DH oil spill has differentially impacted the people who live in the coastal region of Southeast Louisiana. Specifically, this research highlights how the social attributes that characterize people and places influence disaster related vulnerability to disruption.

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Chapter 2: Crude on the Bayou

An underpinning concern in the social science scholarship on disasters is community impacts and recovery. Indeed, an oft cited definition (Fritz 1961: 655) implicitly acknowledges community within the very concept of disaster: "an event, concentrated in time and *space*, in which a society, or a relatively *self-sufficient subdivision of a society*, undergoes severe danger and incurs such losses to its members and physical appurtenances that the social structure is disrupted and the fulfillment of all of or some of the essential functions of the society is prevented" (emphasis added). From such a conceptualization, community is seen as self-sufficient politically bounded systems, and disaster research accordingly focuses on impacts to these sociopolitical collectives—e.g. cities and towns (see also Kendra and Wachtendorf 2007). However, as a social process, the ways a community responds to catastrophic disruption tend to differ insofar as the disaster process is viewed as 'natural' or 'man-made.' (e.g., Freudenburg 2000 see also; Gill and Picou 1998; Kroll-Smith and Couch 1990; Tierney 2007). In a context with a natural disaster catalyst, it is argued that a "therapeutic community" is likely to emerge as people exhibit a high level of cohesiveness and provide mutual aid in response and recovery efforts. Conversely, technological disasters are said to bring about a community response rife with divisions and conflict. Such responses have been referred to as a "corrosive community."

The purpose of the present study is twofold: (1) to assess the extent to which community attitudes and sentiment are impacted in the wake of a technological disaster, and (2) to ascertain the influence of theoretically relevant precursors of corrosive community on community attitudes and sentiment. I attend to these goals by studying the effects of the 2010 BP- Deepwater Horizon oil spill on coastal residents of Southeast Louisiana. Taken together, this study helps to extend the general social scientific understanding of disasters (e.g., Erikson 1976, 1994; Myers, Slack, Singelmann 2008; Quarantelli 2005; Quarantelli and Dynes 1977), with a more specific contribution to the scholarly literature on how a technological disaster can impact and alter the "lifescape" (Edelstein 2004) of communities (e.g., Gill, Picou, and Ritchie 2012; Kroll-Smith and Cough 1991; Lee and Blanchard 2012; McSpirit et al. 2007). More specifically, a key contribution of this study is the simultaneous consideration of two leading approaches to conceptualizing community attitudes and sentiment: the systemic model of community (e.g., Kasarda and Janowitz 1974) and the corrosive community framework (e.g., Freudenburg 1993). Consequently, these efforts have important theoretical implications for disaster impact assessment as well as mitigation and recovery efforts.

2.1 Community Response to Disasters

While the word “community” is often idealized because it “feels good” and conjures imagery of “a ‘warm’ place, a cozy and comfortable place...like the roof under which we shelter in heavy rain, like a fireplace at which we warm our hands on a frosty day” (Bauman 2001:1), it carries with it fundamental assumptions of “a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members’ needs will be met through their commitment to be together that it members hold common interests, aspirations, and needs” (McMillan and Chavis 1986: 9). In fact there are some scholars who explicitly theorize community as moral proximity (see e.g., Bauman 2001; de Tocqueville 1840/2000; Gombay 2010; Goodsell, Flaherty and Brown 2014), while others view it as fundamental to the formation of individual and shared interpretive frameworks and social paradigms—termed “lifescape” by Edelstein (2004)—underpinning normal assumptions about life.

Conversely, other scholars contend (e.g. Elias and Scotson 1965; Peacock and Ragsdale 1997) that the positive “feels good” associations ascribed to community more often are reflective of wishful thinking than they are of real social conditions. Such scholars view community as being underpinned with conflict as much as it is with consensus, as members—with competing interests—negotiate for resources and power. Accordingly, contention may result in an unequal distribution of risk amongst community residents as “the very idea of controllability, certainty and security…collapses” (Beck 1999: 2). Such risks, according to Beck (e.g., 1999; 1992), are a defining characteristic of contemporary social life and, consequently, controversy and conflict may arise as various community members attend to certain hazards, insecurities, and threats, while other groups may seek to downplay the same issues. Such conflicts can be exacerbated following a collective trauma, thus threatening “the essential functions of society” (Fritz 1961: 655) and disrupting typical social order. Indeed, early social scientific investigations of disasters endeavored to understand just how such disruptions occur (e.g., Bucher 1957; Killian 1954; Wallace 1956).

Building off of groundbreaking research (e.g., Fritz and Marks 1954; Moore 1958; Sjoberg 1962;), a social scientific perspective emerged that contends “disasters” only occur when hazardous events cause people to collectively perceive disruption of normal social activities (e.g., Fritz 1961; Quarantelli 1989; Quarantelli and Dynes 1977; Saenz and Peacock 2006). Indeed, Quarantelli (2000: 682) conceptualizes disasters in terms of a social processes occurring when “the routines of collective social units are seriously disrupted and when unplanned courses of action have to be undertaken to cope with the crisis.” Thus, disaster related outcomes are predicated on (1) preexisting social structures, and (2) the significance of these structures for both individual and collective responses (Chhotray and Few 2012; Picou et al. 2004; Smith 2006; Smith and Wenger 2007). Disasters, then, should be viewed as "systemic" processes "that permeate community social structure, producing social responses that are both emergent and constraining" (Picou et al. 2004: 1495; see also Dynes 1974; Kreps 1985, 1998).

As a systemic social process, the ways disaster victims respond to catastrophic disruption often depend on Thomasian "definition of the situation." For example, when a disaster catalyst is viewed as natural and beyond human control (i.e., "an act of God"), many researchers have found that social, psychological, and economic disruptions are relatively limited in duration (Drabek 1986; Green 1996; Quarantelli 1985). In such contexts, the disaster is viewed as a "consensus-type" crisis (Quarantelli & Dynes 1976) and response efforts often bring about a high level of social cohesiveness while focusing on restoring normalcy for the victims. Contrastingly, empirical evidence has documented that disasters stemming from technological hazards have the potential to "create a far more severe and long lasting pattern of social, economic, cultural and psychological impacts than do natural ones" (Freudenburg 1997:26). Such long-term impacts are part of a debilitating process—termed "corrosive community" (Freudenburg 2000, 1997, 1993)—where negative effects of the disaster damage residents' sense of community and "mortar bonding human communities together" (Erikson 1994: 239) erodes away. Accordingly, research has attended to the linkages between an individual's sense of community and well-being following disaster related disruptions (e.g., Miles 2015; Norris et al. 2008). Moreover, prior research has demonstrated positive community attitudes and sentiments to be a key aspect of disaster resilience and recovery (Cope et al. 2013). Thus, identifying shifts in community attitudes and sentiment throughout the disaster process is important for mitigation and hazard risk management.

2.2 Assessing Community Attitudes and Sentiment

In their seminal 1974 article, Kasarda and Janowitz describe what has arguably become one of the most influential models for studying "local community attitudes and sentiments" (331). Conceptualizing community "as a complex system of friendship and kinship networks and formal and informal associational ties rooted in family life and on-going socialization processes" the authors propose a "model of community attachment which [they] call the *systemic model*" (*ibid*: 329 emphases added). From such a perspective, a local community is viewed as "an ongoing system of social networks into which new generations and new residents are assimilated" (*ibid*: 330). Thus, in the same way scholars conceptualize a disaster as a time-laden process, for Kasarda and Janowitz the development of community sentiments and bonds is “necessarily a temporal process” in which an individual’s length of residence is seen “as the key exogenous factor influencing community behavior and attitudes” (*ibid*: 330). While length of residence is an undergirding component of the systemic model, Kasarda and Jonowitz also focus on local social bonds, lifecycle stage, and social position as principle determinants of community attitudes and sentiments. Since its introduction, numerous studies have affirmed the applicability of the systemic model understanding community attitudes and sentiments (e.g., Beggs, Hurlbert, and Haines 1996; Brown 1993; Cope et al. 2015; Flaherty and Brown 2010; Gerson, Stueve, and Fischer 1977; Krannich and Greider 1984). Furthermore, research has shown, across diverse contexts, significant linkages between individual well-being and sense of community (e.g., Davidson and Cotter 1991; Grzeskowiak, Sirgy, and Widery 2003; Kimweli and Stilwell 2002; St. John, Austin, and Baba 1986; Theodori, 2001), including in technological disaster contexts (Cope et al. 2013; Hawkins and Maurer 2011; Lee and Blanchard 2012).

Inasmuch as local social bonds strengthen community attitudes and sentiments (Kasarda and Janowitz 1974: 330), disruption to those bonds can be disruptive to the lifescape of a community (Chhotray and Few 2012; Edelstein 2004; Erikson 1994; Peacock & Ragsdale 1997). That is, community residents incorporate risk assessments and perceptions in such a way that collective uncertainty alters the lifescape as ontological security and community attitudes and sentiments corrode (see also Lee and Blanchard 2012; Ritchie et al. 2013). Such is the case with technological disasters where, due to the often unknown scope of ecological contamination, communities are "conflict prone" as they must deal with perceptions of seemingly unending risks and uncertainties regarding both environmental and personal exposure (Adeola and Picou 2014; Erikson 1994; Gill 2007; Picou et. al 2004). Typifying such processes, following the *Exxon Valdez* oil spill research has shown how dynamics of uncertainty ultimately culminate in “social responses that draw down reserves of social capital, setting the stage for the emergence of individual and collective trauma, lifestyle and lifescape change, a corrosive community, and secondary trauma” (Ritchie et al. 2013: 658, see also Adeola and Picou 2014; Gill 2007; Ritchie 2012; Ritchie and Gill 2010). Indeed, Picou et al. (2004: 1496) contend that in the wake of catastrophic technological failure and/or toxic ecological contamination “the defining characteristic of the post-disaster phase is the emergence of a corrosive community — that is, a consistent pattern of chronic impacts to individuals and communities” (*sic*).

2.3 Precursors to the Emergence of a Corrosive Community

Research indicates that certain post-disaster social dynamics can be seen as precursors to the emergence of a corrosive community. To wit, three interrelated dynamics of technological disasters have been identified as particularly noteworthy for "understanding why corrosive communities emerge and persist" (Picou et al. 2004: 1496; see also Marshall et al. 2003). Specifically, protracted litigation; mental and physical well-being of community residents; and perceptions of recreancy or governmental and institutional actors failed to properly execute entrusted roles and responsibilities. For the purposes of the present study, I turn attention to the former two[1].

There is a well-known linkage between experiencing a disaster and adverse impacts to mental and physical well-being (see e.g., Bonanno et al., 2010; Norris et al., 2008). Research has found that the most commonly observed impacts to the well-being of disaster survivors are depression (see e.g., Maguen et al 2009), posttraumatic stress disorder (PTSD; see e.g., Neria, Nandi, and Galea 2008), and other anxiety-related disorders (see e.g., McFarlane, Van Hooff, and Goodhew 2009). Moreover, disaster related life conditions can precipitate negative impacts in physical health status (Bonanno et al. 2010; Halpern and Tramontin 2007). While fatalities and injuries following natural disasters are often common among victims of high impact areas, Marshal et al. (2003: 87) note that in the wake of a technological disaster "the most troubling outcome has to do not with direct loss of life, but the potential for long-term health problems and damage to the community." Insofar as such impacts are chronic and accumulative, and physical symptoms can manifest analogous to other ailments, diagnosis is often delayed due to difficulty in pinpointing a specific point of exposure and (Erikson 1994). Thus, with uncertainty regarding the degree to which a community has been exposed to toxins, residents and medical practitioners often have to contend with a "contested" discourse identifying not only the nature and extent of health impacts, but also even who should be counted a "victim" (Edelstein 2004; Erikson 1994; Kroll-Smith and Couch 1991). Indeed, Gill et al. (2014) found that disruptions following the 1989 *Exxon Valdez* oil spill have impacted the well-being of community residents for more than two decades.

The failure of institutions to prevent the manifestation of a technological disaster represents an explicit challenge of a social system as a whole. To understand such malfeasance, Freudenburg theorized *recreancy* as a concept that could "provide an affectively neutral reference to behaviors of persons and/or of institutions that hold positions of trust, agency, responsibility, or fiduciary or other forms of broadly expected obligations to the

[1] For a review of the consequences of protracted litigation to disaster related community impacts see e.g., Gill at al. (2014); Marshall et al. (2003); Marshall, Picou & Schlichtmann (2004); and Picou et al. (2004).

collectivity, but that behave in a manner that fails to fulfill the obligations or merit the trust" (1993: 916-917) and "the failure of experts or specialized organizations to execute properly responsibilities to the broader collectivity with which they have been implicitly or explicitly entrusted" (2000: 116). Thus conceptualized, Freudenburg's focal concern is the relationship between broader social consequences and perceptions of recreancy. In the wake of a technological disaster, research has shown that perceptions of recreancy amplify awareness of risk; cultivate emotional/psychological feedbacks (e.g., anger, distrust, fear, frustration, uncertainty), and exaggerate perceptions of community damage (e.g., Freudenburg 1993; Gill et al. 2014; Gill 2007; Ritchie 2012; Ritchie et al. 2013; Scott et al. 2005). As confidence in the social order is shaken, perceptions of recreancy engender new vulnerabilities as community attitudes and sentiments shift, social bonds are divided, and social differentiation is promoted by diverging narratives of distrust and blame (e.g., Alario and Freudenburg 2003; Clarke and Short 1993; Gill et al. 2012; Tierney 2012). Thus, perception of recreancy is interrelated with impacts to the physical and mental well-being of residents, in turn contributing to chronic patterns from which the seeds of community corrosion are sown.

Existing literature on technological disasters is characteristic of the processes described above, and arguably no technological disaster better typifies these patterns better than the *Exxon Valdez* oil spill (EVOS). Indeed, such is the research undertaken in the wake of the EVOS that a robust literature has been generated which Lee and Blanchard (2012: 27) refer to as a "template for understanding oil spill impacts." This research shows social impacts throughout the community at the macro-level (e.g., economic/occupational, civic); the mid-range level (e.g., community relations, subsistence); and at the micro-level (e.g., family, work, routine, health) (see e.g., for an inclusive review of the EVOS literature see Gill et al. 2014; Gill et al. 2012; Ritchie et al. 2013). Another such disaster was touched off at approximately 9:45 PM on the evening of April 20, 2010, when an explosion sent gas, oil and concrete up the wellbore of the British Petroleum-leased Deepwater Horizon (BP-DH) oil rig located approximately 50 miles offshore of Southeast Louisiana. In addition to the deaths of 11 platform workers, the explosion and subsequent sinking of the rig led to a well leak that gushed oil into the Gulf of Mexico for nearly three months before being capped. The BP-DH spill now stands as the largest recorded marine oil spill (Hamilton, Safford, and Ulrich 2012; Robertson and Krauss 2010) and "the worst environmental disaster" to ever transpire in the United States (Jackson 2010). While the impacts of the BP-DH disaster are just now beginning to unfold, it should be noted that EVOS scholars have predicted "the BP disaster as an Exxon Valdez rerun" (Ritchie, Gill, and

Picou 2011). Accordingly, understanding social disruptions in the wake of the BP-DH disaster is a critical task for social scientists.

2.4 Research objectives

In view of the literature discussed above, I ask the following research questions as they pertain to the residents of the Southeast Louisiana communities impacted by the BP-DH oil spill: (1) Does Kasarda and Jonowitz's (1974) systemic model of community apply for residents of oil spill impacted communities when predicting community attitudes and sentiment over time? (2) Do Picou et al.'s (2004) indicators for understanding the emergence of a corrosive community in the wake of a technological disaster apply in the context of the BP-DH oil spill for predicting community sentiment over time?, (3) given the time ordered nature of the disaster process, does the influence of systemic community indicators change with the inclusion of precursors of corrosive community?

2.6 Sample

These objectives are met via analysis of data obtained from the Louisiana Community Oil Spill Survey (COSS). The COSS is a multi-wave cross-sectional trend dataset that assesses impacts of the BP-DH disaster among Louisiana's coastal residents living in areas directly affected by the spill. Conducted by Louisiana State University's Public Policy Research Laboratory, the COSS is a telephone survey of households randomly drawn from a listed sample of the approximately 6,000 households living in the coastal zip codes of Plaquemines, Lafourche, and Terrebonne Parishes and the City of Grand Isle. Geographic areas sampled in the COSS were selected due to their direct geographic proximity to the BP-DH spill. The repeated cross-sectional nature of these data affords the unique opportunity to examine the BP-DH disaster as a social process, rather than as singular event in time, making it apt for addressing the aforementioned research objectives. Four waves of COSS data are utilized in the present analysis: a baseline gathered in October 2010 (the Macondo well was declared "effectively dead" in mid-September), with three follow-up waves collected in April 2011, April 2012, and April 2013 (corresponding to the one-year, two-year and three-year anniversary of the onset of the disaster). The respective response rates for each wave were 24 percent, 25 percent, 20 percent, and 19 percent. While these response rates were obtained during adverse conditions (i.e. a disaster context), it should be noted that such rates of response are within the range typically obtained by leading survey organizations (e.g., Pew Research Center). It should be further noted that research (e.g., Curtin, Presser, and Singer 2000; Groves 2006; Keeter et al. 2000; Keeter et al. 2006) has demonstrated little threat to the quality of survey estimates stemming from nonresponse bias within this range.

2.8 Dependent Variable

The dependent variable in my analysis measures community attitudes and sentiments. Specifically, I employ a six-item index to measure community sentiment. Items included in the measure are drawn from the Knight Soul of the Community project, a research partnership between Gallup and the Knight Foundation (2012), and have been used in previous investigations of the unfolding ramifications and social impacts of the BP-DH disaster (e.g. Cope et al. 2013; Lee and Blanchard 2012). Importantly, these measures are analogous to those used in previous research into the social correlates of disruption/change and community attitudes and sentiments (e.g. Brown 1993; Kasarda and Janowitz 1974; Smith, Krannich, and Hunter 2001). The index is comprised of the following items:

1. Taking everything into account, how satisfied are you with [name of community residence] as a place to live? (0 = *very dissatisfied*, 1 = *fairly dissatisfied*, 2 = *neither dissatisfied nor satisfied*, 3 = *fairly satisfied*, and 4 = *very satisfied*)
2. How likely are you to recommend [name of community residence] as a place to live? (0 = *extremely unlikely*, 1 = *somewhat unlikely*, 2 = *neither likely nor unlikely*, 3 = *somewhat likely*, and 4 = *extremely likely*)
3. Thinking about five years from now, how do you think [name of community residence] will be as a place to live compared to today? (0 = *Will be much worse*, 1 = *Will be somewhat worse*, 2 = *Will be about the same*, 3 = *Will be somewhat better*, and 4 = *Will be much better*)
4. Please indicate your agreement following statement: I am proud to say that I live in [name of community residence]. (0 = *strongly disagree*, 1 = *disagree*, 2 = *neither disagree nor agree*, 3 = *agree*, and 4 = *strongly agree*)
5. Please indicate your agreement with the following statement: [Name of community residence] is the perfect place for people like me. (0 = *strongly disagree*, 1 = *disagree*, 2 = *neither disagree nor agree*, 3 = *agree*, and 4 = *strongly agree*)
6. Overall, how would you rate your community as a place to live – excellent, good, only fair, or poor? (0 = *poor*, 1 = *fair*, 3 = *good*, and 4 = *excellent*)

Drawing on these six items, I generated a summative index that ranges from 0 to 24. The reliability of the community sentiment scale is acceptable (*alpha* = 0.79).

2.9 Community Change

One of the key independent variables in this analysis is community change. Following the example of many community disruption scholars (e.g. Brown et al. 2005; Cope et al. 2015), I measure community change by pooling the four waves of survey data and then create dummy variables for the second, third, and forth waves (holding the baseline wave as the reference). Thus the coefficient for each dummy variable represents a measure of difference in community attitudes and sentiment between the first wave (October 2010) and each of the subsequent waves of the COSS survey (April 2011, April 2012, and April 2013).

2.10 Systemic Model of Community Control Variables

I include control variables commonly used in the disaster literature, and justified by Kasarda and Janowitz' (1974) extension of the systemic model of community. The principal determinants community attitudes and sentiment, according to Kasarda and Janowitz (*ibid*), are length of residence, local social bonds, lifecycle stage, and social position.

2.11 Length of Residence

Length of residence is measured as the proportion of one's life residing in the community (i.e., the quotient of the number of years the respondent was a community resident divided by their age). Thus, with rounding, in these data length of residence ranges from 0 to 1. This calculation is a slight divergence from measuring length of residence simply as the reported number of years a respondent has been a community resident. The reasoning behind measuring length of residence as a proportion of one's life is that including the raw number of years resident in the community potentially conflates the effects of age and length of residence (see Cope et al. 2015; Goodsell et al 2008; Flaherty and Brown 2010).

2.12 Local Social Bonds

Local social bonds are measured three ways. First, to measure social bonds emanating from membership in a large local ethnic group I distinguish Cajuns from all other groups (Cajun=1, other=0). Second, to measure local social bonds stemming from connection to community economic identity, what Kasarda and Janowitz (1974: 329) refer to as ties to local "occupational systems," I include a set of variables that measure association with the two economically dominant industries in the region: the oil/gas industry and the fishing/seafood industry. Specifically, dummy variables were created based on responses to the following questions (yes=1): "Do you or any member of your immediate family currently work in the oil industry?" and "Do you or any member of your immediate family currently work in the fishing or seafood industries?" Insofar as these are not mutually exclusive categories (see e.g., Freudenburg and Gramling 2011), there exists the possibility that a household could have members employed in the oil *and* the fishing industries. To that end, I include a third dummy variable for households employed in both the oil/gas industries *and* the fishing/seafood industry (yes=1). The third measure of local social bonds included in the analysis presented below pertains to religious identification. Specifically, I included two measures: a dummy variable indicating membership in the predominate religious group in the region (Catholic =1), and a 5-point ordinal scale where higher numbers indicate more frequent church attendance.

2.13 Lifecycle Stage

Three variables are used to control for the effect of respondents' lifecycle stage on community attitudes and sentiments: (1) age, which I measure as a continuous variable; (2) number of children age 17 or younger living in the respondent's household, which I truncated at 7 or more; and (3) marital status, which is coded as 1 for respondents who were married or widowed, and 0 for all others.

2.14 Social position

To control for respondents' social position on community attitudes and sentiments I include two variables. The first is the number of years of schooling respondents report having completed. I also measure respondents' social position by including a dummy variable for employment status (yes = 1).

2.15 Additional controls

I include three additional control variables beyond those called for in Kasarda and Janowitz' (1974) elaboration of the systemic model of community. Specifically, I include I include three additional control variables for race (White = 1) and biological sex (female = 1). Additionally, I use an 8-point ordinal scale to measure proximity to the coast (larger values denote greater distance).

2.16 Precursors of Corrosive Community

Precursors of corrosive community are measured in four ways. The first two measures relate to mental and physical well-being. Mental health impacts are measured with as an index of negative affective states. To measures this, respondents were asked: "In the last week, how often have you experienced the following feelings because of the oil spill?'' (Responses included almost constantly, some of the time, almost never, and never). The list of feelings included worry, sadness, nervousness, fear, depression, anxiety, and anger. Each item ranged from 0 to 3 where 0 = never and 3 = almost constantly. I created an index by summing the scores across all seven indicators, resulting in a measure that ranges from 0 to 21. The reliability of the mental health scale is excellent (*alpha* = 0.92). In terms of physical well-being, respondents were asked: ‘‘In the last week, how often have you experienced the following physical symptoms because of your worries about the oil spill?’’ (Again, responses included almost constantly, some of the time, almost never, and never). The list of physical symptoms included sick stomach, diarrhea, headaches, joint pain, loss of appetite, chest pain, and shortness of breath. I created an index by summing the scores across all seven indicators, resulting in a measure that ranges from 0 to 21. The reliability of the physical health scale is good (*alpha* = 0.88).

The next two precursors of corrosiveness included in the analysis presented below relate to recreancy—residents' perceptions of institutional capacity to fulfill "responsibilities to the broader collectivity with which they have been implicitly or explicitly entrusted" (Freudenburg 2000: 116). Specifically, I capture recreancy by measuring perceptions of distrust and blame. In terms of distrust, three binary measures were obtained by asking respondents to indicate if they "trust information regarding the oil spill" from BP, the federal government, and the state government (no=1). An index was created by summing the scores across these three indicators, resulting in a measure that ranges from 0 to 3. Internal constancy for this measure is acceptable (*alpha* = 0.73, *KR20* = 0.73). Similarly, three binary measures were obtained regarding blame by asking respondents who they "blame for the consequences of the oil spill, such as oil in the marsh, the moratorium on drilling and the closure of fisheries." Again, the responses were BP, the federal government, and the state government (yes=1). Ancillary analysis revealed poor internal consistency when using these measures to generate a summative index of perception of blame. Therefore, a dummy measure was created measuring if the respondent blamed 2 or more the aforementioned institutional actors (yes=1). Descriptive statistics for all variables used in my models are displayed in Table 1.

Table 1: Means for Variables Included in Models by Survey Wave
(standard deviations in parentheses)

Variables	October 2010	April 2011	April 2012	April 2013
Community Sentiment	15.35 (3.33)	15.39 (3.62)	15.86 (3.06)	15.85 (3.10)
Length of residence	0.84 (0.31)	0.85 (0.27)	0.87 (0.27)	0.80 (0.32)
Cajun	0.33	0.49	0.58	0.52
Fishing and seafood employment	0.19	0.21	0.20	0.18

(Table 1 continued)

Variables	October 2010	April 2011	April 2012	April 2013
Oil and gas employment	0.27	0.27	0.29	0.30
Oil/gas & fishing/seafood employment	0.33	0.35	0.31	0.26
Catholic	0.69	0.71	0.73	0.70
Church attendance	3.34 (1.50)	3.45 (1.47)	3.43 (1.48)	3.49 (1.58)
Age	44.68 (16.56)	48.61 (16.63)	49.45 (17.42)	52.54 (16.55)
Marital Status	0.73	0.75	0.71	0.79
Number of Children	1.03 (1.20)	0.94 (1.18)	0.77 (1.10)	0.73 (1.16)
Educational attainment (0-18)	12.46 (2.40)	12.47 (2.36)	12.38 (2.46)	12.53 (2.45)
Employment status: working (yes=1)	0.62	0.55	0.57	0.54
Employment status: retired (yes=1)	0.13	0.19	0.20	0.24
White	0.50	0.35	0.29	0.35
Female	0.46	0.43	0.36	0.40
Proximity to Coast	5.37 (1.90)	5.33 (1.99)	5.11 (2.05)	5.31 (1.97)
Mental health	8.19 (6.39)	8.43 (6.67)	7.15 (6.34)	5.95 (6.10)
Physical heath	4.27 (5.31)	4.71 (5.40)	4.16 (5.20)	3.31 (4.62)
Distrust	1.81 (1.15)	1.89 (1.11)	1.82 (1.16)	1.73 (1.25)
Blame	0.45	0.56	0.45	0.50
N	871	798	572	487

2.17 Modeling Strategy

Ordinary least squares (OLS) regression models are specified to predict levels of community attitudes and sentiments in the wake of the BP-DH oil spill. Due to differential probabilities in sample selection related to higher levels of nonresponse amongst certain segments of the population, these data are weighted by age and sex on the basis of the ratio of the distributions of these groups in the COSS versus those found from relevant zip codes based on the 2005-2009 American Community Survey (see Cope et al. 2013; Lee and Blanchard 2012).

2.18 Results

OLS regression estimates predicting community attitudes and sentiments are presented in Table 2. The first model includes the key independent variable (i.e., community change), the principal determinants community attitudes and sentiment, according to Kasarda and Janowitz’ (1974) systemic model of community (i.e., length of residence, local social bonds, lifecycle stage, and social position) and controls (i.e. race, biological sex, and proximity to the coast). The results show that mean level of community attitudes and sentiments are, net of other factors, significantly higher in waves 3 and 4 compared to baseline. That is, relative to the early months of the BP-DH disaster, respondents' report higher levels of community attitudes and sentiments two and three years out from the spill. Additionally, with the exception of Cajun ethnicity and age (the latter marginally significant at p=0.057), all of the measures suggested by the systemic model of community are significantly related to community attitudes and sentiments in the expected direction. In other words, the systemic model of community shows unique direct effects on community attitudes and sentiment. As expected, the vast majority of these measures are associated with increased community attitudes and sentiment, though two predictors—number of children and educational attainment—were shown to have negative effects.

Table 2: OLS Regression Models Predicting Community Attitudes and Sentiment

	Model 1			Model 2			Estimate of Indirect effect		
	b		SE	b		SE	b(d)		s(d)
Community Change									
Wave 1: Oct 2010 (reference)									
Wave 2: Apr 2011	0.01		0.11	0.04		0.11	-0.04		0.04
Wave 3: Apr 2012	0.46	***	0.13	0.36	**	0.12	0.09	*	0.04
Wave 4: Apr 2013	0.48	**	0.14	0.31	*	0.14	0.17	***	0.05
Length of Residence									
Proportion of life as resident	0.68	***	0.16	0.74	***	0.16	-0.07		0.06
Social Ties									
Cajun	-0.12		0.14	-0.05		0.14	-0.07		0.05
Fishing and seafood employment	0.57	***	0.15	0.93	***	0.15	-0.36	***	0.06
Oil and gas employment	0.29	*	0.13	0.34	**	0.13	-0.04		0.05
Oil/gas & fishing/seafood employment	0.32	*	0.13	0.61	***	0.13	-0.29	***	0.05
Catholic	0.87	***	0.10	0.81	***	0.10	0.05		0.04
Church attendance	0.13	***	0.03	0.10	**	0.03	0.02	*	0.01
Lifecycle Stage									
Age	0.01		0.00	0.01	**	0.00	0.00	**	0.00
Marital Status	0.32	**	0.11	0.31	**	0.11	0.01		0.04
Number of Children	-0.14	**	0.04	-0.13	**	0.04	-0.01		0.02
Social Position									
Educational attainment (0-18)	-0.06	***	0.02	-0.08	***	0.02	0.01	*	0.01
Employment status: working (yes=1)	0.78	***	0.12	0.62	***	0.11	0.16	***	0.04
Employment status: retired (yes=1)	0.34	*	0.17	0.09		0.16	0.25	***	0.06

(Table 2 continued)

	Model 1			Model 2			Estimate of Indirect effect		
	b		SE	b		SE	b(d)		s(d)
Control Variables									
White	0.12		0.14	0.10		0.14	0.02		0.05
Female	-0.06		0.10	-0.03		0.09	-0.03		0.04
Proximity to coast	0.11	***	0.02	0.07	**	0.02	0.04	***	0.01
Precursors of Community Corrosion									
Mental health				-0.06	***	0.01			
Physical health				-0.02	*	0.01			
Distrust				-0.32	***	0.04			
Blame				-0.20	*	0.09			
Intercept	12.74	***	0.38	14.16	***	0.38			
Mean Squared Error	10.46			10.01					
Adj. R2	0.06			0.10					

N=2,729. *p<.05; **p<.01; ***p<.001.

In the second model, the theoretically relevant precursors of community corrosion (i.e., impacts to well-being and perceptions of recreancy) are added to Model 1. As expected, all of these measures are associated with a significant decrease in community attitudes and sentiment. That is to say, the precursors of corrosive community measures show unique negative direct effects on community attitudes and sentiment.

Following the method identified by Clogg et al. (1995), Table 2 includes a test for mediation of the effects of the systemic model of community (i.e. Model 1) with inclusion of the corrosive community indicators (i.e. Model 2). Church attendance, age, educational attainment, as well as working and retired employment statuses show significant indirect positive effects to community sentiment. That is to say, corrosiveness amplifies the effect on community attitudes and sentiment. However, these data also show that households with ties to fishing and seafood industries, as well as households with mix-industries ties (i.e., to both the oil/gas and fishing/seafood industries) are associated with higher levels of corrosiveness, yielding lower levels of community attitudes and sentiment. In other words, corrosiveness mutes some of the benefits of the systemic model of community. Surprisingly, wave 3 and 4 are also associated with an indirect amplification of community attitudes and sentiment. This finding runs counter to current theoretical understanding (i.e. corrosive community) and future research is needed to tease out this relationship. In sum, inclusion of the theoretically relevant precursors of community corrosion muted some of the effects of the systemic model and amplified others.

2.19 Discussion

This study set out to assess three objectives directed towards an empirical assessment of impacts to community attitudes and sentiments following the 2010 BP Deepwater Horizon oil spill. The first objective was to establish the validity of Kasarda and Janowitz' (1974) systemic model for assessing emergent patterns of corrosion of community attitudes and sentiments over time. The results confirm the applicability of the systemic model for identifying unique direct effects on community attitudes and sentiment, and show that levels of attitudes and sentiments were significantly higher two and three years out from the spill.

A second objective of the study was to assess the influence of theoretically relevant precursors of corrosiveness on respondents' community attitudes and sentiments. As expected, these data show that lower levels of community attitudes and sentiments are linked to negative well-being and increased perceptions of recreancy. This provides support for the notion that post-disaster dynamics can introduce a social toxicity which can disaffect members of a community from each other.

The final objective was to determine whether the relationship between community attitudes and sentiments and the systemic model is mediated by corrosive dynamics introduced into the social fabric in the wake of the disaster. In this regard I find mixed results. That is, higher levels of corrosiveness were shown in some cases to amplify the effects of the systemic model promoting positive community attitudes and sentiments, while it was shown to mute its effects for households with ties to fishing and seafood industries and for households with mixed industry ties (i.e. fishing/seafood *and* the oil/gas industries). This finding suggests an especially acute vulnerability for fishing and seafood households; a finding consistent the established EVOS literature (Picou and Gill 1997; Ritchie and Gill 2010) and with the burgeoning research on the social consequence of the BP-DH oil spill (Cope et al. 2013; Lee and Blanchard 2012). While it is too soon to determine the long-term consequences of the BP-DH oil spill on community attitudes and sentiments, these finding indicate a need for continued study. It could well be that the mixed results are indicative of a broader crisis of legitimation (Habermas 1973) as divisions arise within the community and divergent narratives form.

This study contributes to the extant social scientific understanding of disasters (e.g., Erikson 1976, 1994; Myers, Slack, Singelmann 2008; Quarantelli 2005; Quarantelli and Dynes 1977), including literature on oil spill related disaster processes (e.g., Gill et al 2014; Lee and Blanchard 2013; Ritchie et al. 2013), and literature on the applicability of the systemic model for understanding community attitudes and sentiments (e.g., Beggs, Hurlbert, and Haines 1996; Brown 1993; Cope et al. 2015; Flaherty and Brown 2010; Gerson, Stueve, and Fischer 1977; Krannich and Greider 1984). More specifically, I attend to social dynamics identified as precursors to the emergence of a corrosive community (e.g., Gill 2007; Marshall et al. 2003; Ritchie et al. 2013). By conceptualizing community attitudes and sentiments in terms of the systemic model, greater variation in chronic corrosive social pathology is recognized following a technological disaster. Such considerations provide a broader sociological understanding regarding disaster catalysts, sense of community, social systems, and emergent "chronic corrosive processes" (e.g., Picou and Marshall 2007).

Despite these contributions, this study has several notable limitations. For example, given the relatively short amount of time that has transpired since the onset of the BP-DH disaster my analysis focused exclusively on well-being and perceptions of recreancy as potential corrosive agents to "the mortar bonding human communities together" (Erikson 1994: 239). Research suggests protracted litigation as an additional feature of disaster process which can potentially promote social vulnerabilities, cultivate a corrosive community, and "undermine a timely recovery process" (Picou et al 2004: 1497; see also Gill and Picou 1998; Marshall et al 2003). Accordingly, future research should assess how uncertainty regarding ligation outcomes influences disaster recovery in the wake of BP-DH. Furthermore, my models did not include measures of social ties that captured a range of stronger-to-weaker ties (i.e. Granovetter 1973) or indicators of social capital, which has been shown to be an important indicator for understanding social impacts following a disaster (Adeola and Picou 2014; Ritchie 2012; Ritchie and Gill 2010). Future research should endeavor to parse out the unique contributions of social capital, community sentiment, and disaster vulnerability/resilience. Lastly, while this study is based on cross-sectional trend data, future studies should consider a panel design to better track within unit social dynamics associated with shifts in community attitudes and sentiments.

In conclusion, I echo Dowty and Allen (2011: 203) who state: "[w]hether [a] disaster is deemed 'natural' or 'man-made', all disasters begin and end in communities and the social groups, networks and politics that sustain them." As such, this research has the potential to influence public policy in a number of important ways. First, it highlights that disaster impacts are influenced by characteristics and attributes of people and places. Disaster mitigation efforts have disproportionately concentrated on biophysical hazards (e.g., fortification of levees and seawalls to defend against a storm surge). However, insofar as risk, costs, and impacts—indeed the very consideration of what constitutes disaster—are socially constructed, this study dovetails with the many social scientists who contend that communities and their residents should be central in disaster planning and considerations. As such, disaster planners should be attuned to the potential for different types of disasters to have divergent consequences for certain types of people in impacted localities. Accordingly, community development efforts need to identify key attributes that can mute or amplify disaster related impacts, such as community attitudes and sentiments, as a central aspect of mitigation strategies. Finally, this research adds to the chorus of researchers who have long contended that planners to need recognize disasters not as a singular event, but as processes linked to long-term antecedents and long-term consequences.

2.20 References

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Chapter 3: Emplaced Social Vulnerability to Technological Disasters

According to Beck (e.g., 2000, 1992), a culture of risk, embedded into modern western society, engenders acute impacts in everyday social life. Perhaps no recent event, in the United States, better typifies this than the disastrous events coupled to the sinking of the BP-leased Deepwater Horizon (BP-DH) oil rig in the Gulf of Mexico (Freudenburg and Gramling 2011). On the evening of April 20, 2010, an explosion on the BP-DH drilling rig, located approximately 50 miles off the shores of Southeast Louisiana, killed eleven workers and set a chain of events into motion which subsequently resulted in “the worst environmental disaster” ever experienced by the United States (Jackson 2010) and the largest marine oil spill ever recorded (Hamilton, Safford, and Ulrich 2012; Robertson and Krauss 2010).

In the wake of the BP-DH disaster, many natural resource industries were severely damaged and/or threatened. Such impacts are particularly relevant inasmuch as the coastal areas most distressed following the disaster largely consist of small rural communities with natural by resource-based economies. Prior research has demonstrated that communities such as these, which often operate under external control of resources and face unpredictable fluctuations in market demand, are particularly vulnerable to risks and disruption in a disaster context (e.g., Arata et al. 2000; Cope et al. 2013; Dyer, Gill, and Picou 1992; Gill and Picou 1998; Ritchie and Gill 2010). Indeed, the economic loss, fatalities, and other disruptions deriving from disasters are not uniformly distributed among groups of individuals, communities, regions and within nations (Clark et al. 1998; Yoon 2012). Vulnerable populations are those who are disproportionately more likely to suffer negative impacts in a disaster context. The extent to which communities—and groups of individuals—are vulnerable to disaster related disruption is determined not only by exposure to the hazard but also by emplaced social vulnerability characteristics. Social vulnerability, broadly defined as the “potential for loss of property or life” (Cutter, Mitchell and Scott 2000: 715), describes place-based attributes and conditions that influence the ability of a location to prepare for, respond to, and recover from disasters (Cannon 1994). As an emplaced attribute, vulnerability hinges on context (Brooks, Adger, and Kelly 2005), thereby helping to inform why different communities often experience the same hazard event differently (Morrow 2008). To that end, the present study is an examination of how differentially emplaced attributes correspond to divergent disruptions over time for residents of coastal Louisiana living in ZIP Code Tabulation Areas (ZCTAs) directly impacted by the BP-DH oil spill. This study extends the general literature on the sociology of disasters (e.g., Kreps and Drabeck 1996; Lee and Blanchard 2012; Quarantelli 1989; Smith and Wenger 2007) and more specifically contributes to scholarship addressing how emplaced social vulnerability influences the experience of a hazard event and its corresponding disaster process (e.g., Azar and Rain 2007; Boruff, Emrich, and Cutter 2005; Chakraborty, Tobin and Montz 2005; Cutter et al. 2003; Myers, Slack, and Singelmann 2008).

3.1 Conceptualizing Vulnerability to Disasters

Social scientific researchers have long understood that hazard and disaster contexts threaten "the essential functions of society" (Fritz 1961: 655) and disrupt the conventional social order (e.g., Fritz 1961; Moore 1958; Sjoberg 1962). From this understanding, a social scientific perspective emerges that stresses that such events become "disasters" only after a collective awareness that normal social activities have been disrupted (e.g., Fritz 1961; Quarantelli 1989; Saenz and Peacock 2006). As such, Quarantelli (2000: 682) conceptualizes a disaster as a process transpiring when "the routines of collective social units are seriously disrupted and when unplanned courses of action have to be undertaken to cope with the crisis." Smith's (2006) conceptualization goes further, asserting that "there is no such thing as a natural disaster. In every phase and aspect of a disaster—causes, vulnerability, preparedness, results and response, and reconstruction—the contours of disaster and the difference between who lives and who dies is to a greater or lesser extent a social calculus" (see also Chhotray and Few 2012; Kreps 1998, 1989; Kreps and Drabeck 1996; Smith and Wenger 2007).

The images of human suffering which emerged in the wake of 2005's Hurricane Katrina clearly demonstrate the social dimensions of a disaster. Indeed, these images clearly depict a human landscape where the contours of social and economic inequality culminated in a context where individuals were differentially susceptible to the disaster (Myers et al. 2008). Researchers conceptualize this notion as social vulnerability (Cutter 1996; Hewitt 1998; Myers et al. 2008; Oliver-Smith 1996; Oliver-Smith and Hoffman 1999; Quarantelli 2005; Tierney 2006; Wisner et al. 2004). Social vulnerability emphasizes "the various ways in which social systems operate to generate disasters by making people vulnerable" by influencing "their capacity to anticipate, cope with, resist, and recover from the impact" of a hazard (Wisner et al. 2004:11). Cope et al. (2013: 873) summarize social vulnerability as "a spectrum along which disaster impacts on the more socially disadvantaged (i.e., vulnerable) can be contrasted with the more socially advantaged (i.e., resilient)."

The consideration of social vulnerability encourages the conceptualization of a disaster not as a singular event, but rather as a temporal process which can bring about different consequences over time (e.g., Cope et al.

2013; Picou, Marshall, and Gill 2004). Furthermore, it should be noted that there are varying risks which can spark a disaster process (e.g., Beck 1992). Examples include: geophysical hazards (e.g., hurricanes and tsunamis); biological hazards (i.e., insect infestation and disease epidemics); environmental degradation (e.g., drought and desertification); as well as technological hazards (e.g., oil spills and other pollutants) (Dynes and Drabek 1994; McGuire et al. 2002; Picou et al. 2004). Bolin (1998: 27), describing a multidimensional conceptualization, notes that unfolding disasters "involve the intersection of the physical process of a hazard agent with the local characteristics of everyday life in a place and larger social and economic forces that structure the realm." In sum, social vulnerability centers on understanding the long-term antecedents, as well as potential long-term consequences, of emplaced cultural, economic, and biophysical features of a place (e.g., Chhotray and Few 2012; Cutter et al. 2003; Hewitt 1998; Tierney 2006).

The aforementioned social processes are typified in the existing literature on communities impacted by oil spills (e.g., Arata et al. 2000; Gill and Picou 1998; Lee and Blanchard 2012; Picou et al. 2009; Picou et al. 1992). Two decades before the BP-DH disaster, the *Exxon Valdez* oil spill (EVOS) was the most well-publicized and severe oil related disaster in the United States. In the years since the *Exxon Valdez* oil tanker ran aground on Bligh Reef in Prince William Sound, Alaska the social and ecological research undertaken has culminated in a robust literature which Lee and Blanchard (2012: 27) refer to as a "template for understanding oil spill impacts" (e.g., Gill and Picou, 1998; Gill, Picou, and Ritchie 2010; Palinkas et al. 1993; Ritchie 2012). One form of vulnerability highlighted in the EVOS literature is that economic reliance on natural resources was linked to heightened psychological stress in the wake of the disaster (e.g., Arata et al. 2000; Picou and Gill 1997; Picou et al., 1992). This finding has been echoed in recent research on the BP-DH disaster (e.g., Cope et al. 2013; Gill et al. 2012; Lee and Blanchard 2012). For example, Cope et al. (2013) found that households employed in the fishing and seafood industry exhibit significantly higher levels of negative mental health impacts, which show no significant improvement over time. This finding suggests that immediate and long-term environmental threats posed by the oil spill to the seafood industry may have had a particularly acute impact on the mental health of those whose livelihoods depend on a healthy and productive fishing environment as well as a marketplace that views their products as safe and desirable; thus showing fishing households to occupy a uniquely vulnerable position within the region. Conversely, this research shows that a higher level of positive community sentiment, when compared to others, was linked to increased resilience over time.

These results underscore that social vulnerability is a multidimensional concept shaped by the social attributes that characterize people and places.

3.2 Emplaced Social Vulnerability

One method used to empirically quantify social vulnerability is the Hazards-of-Place model conceptualized by Cutter (1996). Building off the work of Hewitt and Burton (1971)—who attempted to map multi-hazard occurrences in order to identify a regional ecology of natural hazard events—Cutter's theoretical model combines biophysical conceptualizations of vulnerability with emplaced social considerations that potentially predispose (or disincline) some localities to greater environmental risks. The combination of these approaches "permits an examination of both the biophysical and social vulnerabilities as they affect places" (Cutter 1996: 537) while also assessing their intersections and interactions. In the Hazards-of-Place model (see Figure 1) different elements are drawn together that contribute to a place's overall vulnerability. In the model, risk and mitigation combine to create the hazard potential of a given place. In turn, hazard potential interacts with both the geographic context and the social fabric within which it is emplaced. This interaction can enhance or moderate hazard potential, which results in biophysical and social vulnerability. As social and biophysical vulnerability are drawn together, the overall vulnerability of a place emerges. Ultimately, a feedback loop pushes place vulnerability to interact with the initial risk and mitigation inputs. This approach allows vulnerability to be conceptualized as a multidimensional concept that can be used to identify key characteristics of communities (and individuals) that can potentially increase or decrease place vulnerability.

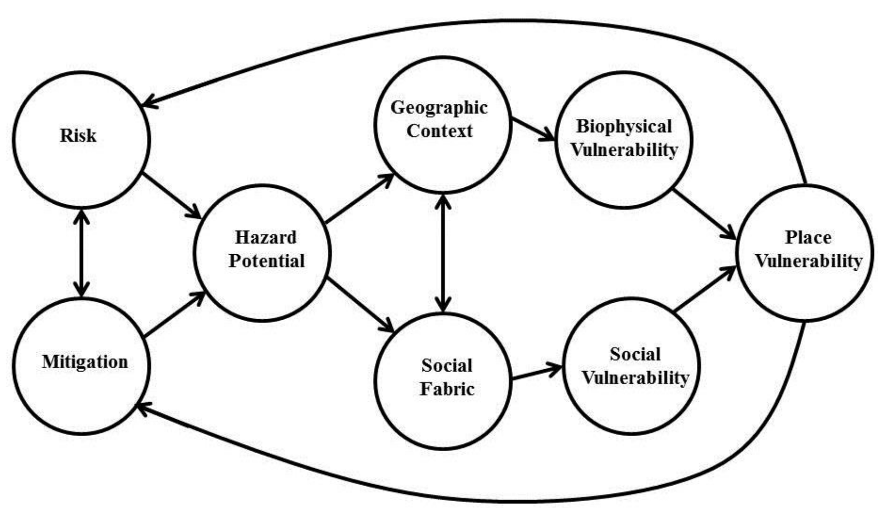

Figure 1: Cutter's (1996) Hazards-of-place model of Vulnerability

The conceptual Hazards-of-Place model was empirically validated by Cutter, Boruff and Shirley (2003) in their study of social vulnerably to environmental hazards within the United States. In their study, aggregate (i.e., county-level) demographic and socioeconomic data were drawn upon to construct an index of place-based social vulnerability. Using principal component factor analysis, 42 target variables—identified in the vulnerability literature as theoretically relevant—were reduced to 11 independent dimensions which accounted for 76.4% of the variance in the original data. By summing the 11 emergent factor scores, Cutter et al. (2003) in turn generated a comprehensive vulnerability score—which they refer to as the Social Vulnerability Index (SoVI)—for each county. The authors note that by opting for an additive model, they make "no *a priori* assumptions about the importance of each factor in the overall sum…each factor [is] viewed as having an equal contribution to the county's overall vulnerability" (*ibid*: 254), thus allowing for the interactive nature of vulnerability. Ultimately, Cutter et al. (2003) used the individual SoVI scores as a county-level comparative metric of vulnerability to natural hazards emplaced in the demographic and socioeconomic profile. Not only can the SoVI be used to identify the locations of at-risk populations, it can also be used to effectively consider shifts in relative vulnerability across space and time (Cutter and Finch 2008).

While the SoVI approach was originally conceived as an assessment of county-level social vulnerability within the United States, it has been—and continues to be—replicated and elaborated on by scholars. Researchers have used the SoVI to address a wide array of topics such as levee failures (Burton and Cutter 2008), climate variability and coastal erosion (Boruff, Emrich, and Cutter 2005), hazard related population evacuation (Charkaborty, Tobin and Montz 2005), coastal inundation and storm surge (Rygel, O'Sullivan and Yarnal 2006), and flooding (Azar and Rain 2007; Fekete 2009). Additionally, the SoVI has been applied in diverse geographic settings such as Canada (Andrey and Jones 2008), the Caribbean Island nations (Boruff and Cutter 2007), China (Chen et al 2013), Norway (Holand and Lujala 2013), and Portugal (de Oliveira Mendes 2009). Moreover, the SoVI has been used to assess different spatial measures (e.g., Cutter, Boruff and Shirley 2003; Cutter et al. 2006; Kleinosky, Yarnal and Fisher 2006) as well as differing time periods (e.g., Cutter and Emrich 2006; Cutter and Finch 2008). Throughout these studies the SoVI approach to understanding emplaced vulnerabilities has continually demonstrated its applicability to the examination of patterns of vulnerability.

An additional application of the SoVI, of particular note to the present study, is the work of Myers et al. (2008), who developed an index of social vulnerability for the Gulf of Mexico Region at the county/parish level and then examined how its various dimensions work related to migration patterns in the wake of the 2005 Hurricanes Katrina and Rita. Their results highlight the multidimensional nature of emplaced vulnerability and indicate that places characterized by greater proportions of disadvantaged populations, housing damage, and, to a lesser degree, more densely built environments, were significantly more likely to experience outmigration following the hurricanes. Insofar as many of the coastal areas included in Myers et al.'s (2008) study would again face potential impacts following the 2009 BP-DH oil spill, their work provides a springboard for identifying vulnerable populations in the wake of this disaster. However, a direct replication of the initial approach would be limited due to its reliance on a scale that would undoubtedly mask intra-county/parish variation in social vulnerability. To that end, measures would need to be developed at more localized levels, thereby enabling a clearer understanding of not only the impacts that the spill has had on people in South Louisiana, but also how the social characteristics of different communities have influenced these impacts.

3.3 Summary and Expectations

In summary, prior research indicates that disasters are best understood in terms of social processes, not as temporally delimited events. This allows researchers to better identify the mechanisms by which communities are divergently vulnerable to disaster related disruptions, and how within these communities the individuals and households can themselves also be differentially vulnerable. An example of such differentiation is demonstrated by Cope et al. (2013) showing that households whose livelihood is linked to fishing and seafood as uniquely vulnerable to negative mental health impacts following the BP-DH disaster Additionally, research on identifying aggregate level attributes of social vulnerability has demonstrated the applicability of the SoVI for examining multidimensional patterns of vulnerability. In this paper, I examine such patterns by extending Cope et al.'s (2013) analysis of negative mental health impacts ensuing from the BP-DH disaster by examining how these relationships are influenced by the emplaced characteristics of social vulnerability. Consistent with Cope et al.'s findings, I anticipate significant recovery in negative mental health impacts over time. However, by incorporating Cutter et al.'s (2003) approach to assessing emplaced social vulnerability I anticipate that mental health recovery will be slower for households in areas demarked with a higher SoVI score. Detailed descriptions of the analytical methods used to test these expectations are provided below.

3.4 Research Objectives

Given the literature outlined above, my research objectives, in relation to the BP-DH oil spill, are twofold: (1) to develop emplaced social vulnerability indexes (SoVI) for oil spill affected areas, and (2) to examine how mental health related impacts that are correlated to the BP-DH oil spill are influenced by emplaced levels of social vulnerability.

3.5 Data

These objectives are met via the joint analysis of data from Community Oil Spill Survey (COSS) and U.S. Census Bureau products. The COSS is a one-of-a-kind study that provides a baseline and four subsequent waves of data on stress, physical/mental health, social capital and community attachment among residents of oil spill affected areas in South Louisiana. Conducted by Louisiana State University's Public Policy Research Lab (PPRL) the COSS is a Random Digit Dialing (RDD) telephone survey that covers a sample of about 1,000 of the approximately 6,000 Louisiana households living in the coastal portions of Plaquemines, Lafourche, and Terrebonne Parishes. The large sample size and collection of ZIP Code community identifiers permits data collected in the COSS to be aggregated at the ZIP Code level. The communities in the study were selected because of their high level of involvement in the oil and gas and fishing industries—sectors directly affected by the spill and subsequent drilling moratorium—as well as their direct proximity to the BP-DH spill. Baseline data in the COSS was collected in June 2010, while oil was still actively flowing from the blown Macondo wellhead; a second wave of data was collected in October 2010 (the well had been declared "effectively dead" on September 19, 2010); and three additional waves were collected that correspond to the one-year, two-year, and three-year anniversary of the rig explosion (April 2011, April 2012, and April 2013). The response rates for each wave were 20 percent, 24 percent, 25 percent, 20 percent, and 19 percent, respectively. These rates of response are within the range typically obtained by leading survey organizations (e.g., Pew Research Center) and research has suggests little threat to the quality of survey estimates from nonresponse bias within this range (Keeter et al. 2006). It should be further noted that these response rates were obtained in a disaster context, not under normal conditions. Furthermore, to better represent known characteristics of the target population, subsequent regression models are weighted by age and sex on the basis of the ratio of the distributions of these groups in the COSS data verses relevant data in 2005-2009 American Community Survey (the most contemporaneous measures available at the onset of the BP-DH disaster). As a repeated cross-sectional survey the

COSS provides a unique opportunity to investigate the BP-DH disaster as a social process, rather than as an event at a singular point in time, making it uniquely suitable for addressing the aforementioned research questions.

Demographic, social, and economic data were drawn from four U.S. Census Bureau sources: (1) 2007-2011 American Community Survey 5-Year Estimates; (2) 2010 County Business patterns; (3) the 2000 Census; and (4) the 2010 Census. Census Bureau data were collected using ZIP Code Tabulation Areas (ZCTAs) as the unit of analysis. ZCTAs are a generalized representation of U.S. postal ZIP Code service areas. While the U.S. Census Bureau notes that—due to differences in how ZCTAs and ZIP Codes are delineated—there is a possibility that "some addresses will end up with a ZCTA code different from their ZIP Code" (U.S. Census Bureau 2014), ancillary analysis revealed a general agreement between the ZCTA and the boundaries of the 9 ZIP codes included in the COSS data. By combining the COSS and aggregated data from the U.S. Census Bureau I am able to develop measures at more localized levels, thereby enabling a clearer understanding of not only the impacts of the spill on people in South Louisiana, but also how the social characteristics of different communities have influenced these impacts.

3.6 Dependent Variable

The dependent variable in my analysis is an index of negative mental health symptoms. This index is a direct replication of the measure used by Cope et al. (2013), and is consistent with those used by Lee and Blanchard (2012) in their study of the BP-DH disaster. More specifically, respondents were asked the following question: "In the last week, how often have you experienced the following feelings because of the oil spill?" (Responses included almost constantly, some of the time, almost never, and never). The list of feelings included worry, sadness, nervousness, fear, depression, anxiety, and anger. Each item ranged from 0 to 3 where 0=never and 3=almost constantly. In turn, an index was created by summing the scores across all seven indicators, resulting in a measure that ranges from 0 to 21. The alpha reliability of the negative mental health index is excellent at .91.

3.7 Aggregate-Level Independent Variables

The independent variables selected for developing the SoVI are drawn from identified indicators of vulnerability, as delineated in in the literature. Specifically, I use 20 variables that capture demographic and socioeconomic characteristics at the ZIP Code level. Descriptive statistics for these variables are displayed in Table 3. The expected association in emplaced vulnerability for each of the independent variables is listed in Table 4. In general these 20 variables capture various dimensions of vulnerability (e.g., social inequality, density of the human and built environment, and economic structure) which should correlate to variation in susceptibility to disaster related disruptions. All measures were scaled so that higher values correspond to increased levels of social vulnerability and lower values indicate reduced social vulnerability. Doing so necessitated the rescaling of seven of the variables as the multiplicative inverse (1/x) of their original value.

Table 3: Descriptive Statistics for Aggregate Level Variables Indicating Social Vulnerability

Variables	Mean	SD	Min	Max
Percent Area Land*	63.9	25.8	27.7	98.7
Percent 5 years and younger	7.3	2.9	4.6	18.1
Percent 65 years and older	14.2	1.6	11.1	17.1
Percent White, non-Hispanic *	80.1	14.4	27.9	93.0
Percent female-Headed Households	12.1	3.4	7.2	24.5
Percent of housing units mobile homes	20.7	10.3	8.8	63.5
Median Value Owner-Occup. Housing ($)*	95,552.0	16,314.0	65,600.0	128,900.0
Percent w/o H.S. diploma (25+)	33.2	6.0	20.5	41.2
Percent unemployed (16+)	7.2	2.3	2.1	12.8
Percent in poverty	19.1	9.7	10.9	47.8
Percent social security recipients	11.9	2.4	8.7	16.4
Percent with Snap Assistance	5.9	1.5	4.0	8.6
Percent household income ≥ $75000*	25.8	5.6	13.1	33.2
Number of commercial establishments*	1.3	1.2	0.2	5.5
Number of paid employees*	2,438.0	2,577.0	20.0	6,375.0
Annual payroll for commercial establishments*	81,738.0	80,380.0	1,661.0	223,312.0
Percent population change 2000 to 2010	-16.6	14.7	-62.7	4.1
Percent of workers employed in farming, fishing, and forestry occupations	3.8	1.7	2.0	9.3
Percent of workers employed in construction, extraction, maintenance and repair occupations	15.3	4.9	10.1	28.4
Percent rural	36.1	31.4	5.4	100.0

Notes: SD = standard deviation. Max = maximum. Min = minimum value

* Original distribution presented, but variables were rescaled as their inverse (1/x) for the factor analysis

N = 3791

Table 4: Aggregate Level Variable Associations with Social Vulnerability

Variables	Expected association with vulnerability
Percent area land	(–)
Percent 5 years and younger	(+)
Percent 65 years and older	(+)
Percent white, non-Hispanic	(–)
Percent female-headed households	(+)
Percent of housing units mobile homes	(+)
Median value owner-Occupied housing ($)	(–)
Percent < high school (age 25+)	(+)
Percent unemployed (age 16+)	(+)
Percent in poverty	(+)
Percent social security recipients	(+)
Percent with SNAP	(+)
Percent household income ≥ $75000	(–)
Number of commercial establishments	(–)
Number of paid employees	(–)
Annual payroll for commercial establishments	(–)
Percent population change 2000 to 2010	(+)
Percent of workers employed in farming, fishing, and forestry occupations	(+)
Percent of workers employed in construction, extraction, maintenance and repair occupations	(+)
Percent rural	(+)

Note: See Cutter et al. (2003) for greater elaboration on vulnerability concepts and metrics

3.8 Household-Level Independent Variables

To further identify the mechanisms that may make households differentially vulnerable to negative mental health impacts following the BP-DH disaster, I include a range of household-level independent variables. These measures likewise evolve from the literature on social vulnerability. The first independent variable included in the analysis is time. I measure time by pooling the five waves of survey data and then creating dummy variables for the second, third, fourth, and fifth waves (the baseline wave is the reference).

A second household-level independent variable is community sentiment. I measure community sentiment with a five-item index. These items are drawn from the Knight Soul of the Community project, a research partnership between Gallup and the Knight Foundation (2012), and were used by Lee and Blanchard (2012) and Cope et al. (2013) in previous studies on the BP-DH spill. The measures are also very comparable to those used in previous studies assessing the relationship between community attachment and the mental health outcomes (e.g., Grzeskowiak et al., 2003; Kimweli and Stilwell, 2002; O'Brien et al., 1994; St. John et al., 1986). The items include the following:

1. Taking everything into account, how satisfied are you with [name of community residence] as a place to live? (0 = *very dissatisfied*, 1 = *fairly dissatisfied*, 2 = *neither dissatisfied nor satisfied*, 3 = *fairly satisfied*, and 4 = *very satisfied*)
2. How likely are you to recommend [name of community residence] as a place to live? (0 = *extremely unlikely*, 1 = *somewhat unlikely*, 2 = *neither likely nor unlikely*, 3 = *somewhat likely*, and 4 = *extremely likely*)
3. Please indicate your agreement following statement: I am proud to say that I live in [name of community residence]. (0 = *strongly disagree*, 1 = *disagree*, 2 = *neither disagree nor agree*, 3 = *agree*, and 4 = *strongly agree*)
4. Please indicate your agreement with the following statement: [Name of community residence] is the perfect place for people like me. (0 = *strongly disagree*, 1 = *disagree*, 2 = *neither disagree nor agree*, 3 = *agree*, and 4 = *strongly agree*)
5. Overall, how would you rate your community as a place to live – excellent, good, only fair, or poor? (0 = *poor*, 1 = *fair*, 3 = *good*, and 4 = *excellent*)

Drawing on these 5 items I created a summative index that ranges from 0 to 20. The alpha reliability for community sentiment is acceptable at .79.

A third set of household-level independent variables taps whether or not a respondent's household includes members employed in natural resource occupations. Specifically, dummy variables were created based on answers to the following questions (yes=1): "Do you or any member of your immediate family currently work in the fishing or seafood industries?" and "Do you or any member of your immediate family currently work in the oil industry?" It should be noted that, insofar as there is a possibility that a household could be made up of members tied to both the oil and fishing industries, these categories are not mutually exclusive. I have opted to maintain operationalization of natural resource employment in this way to extend Cope et al.'s (2013) earlier research.

Additionally, I include a number of control variables. I measure p*roximity to the coast* using an 8-point ordinal scale where higher numbers indicate greater distance from the coast. I measure *length of residence* as the proportion of one's life residing in the community (i.e., the quotient of the number of years residence in the community divided by age). *Employment status* is measured by a series of dummy variables (yes=1) for employed full-time, employed part-time, unemployed, and retired (not in the labor force is the reference). Likewise, *educational attainment* is measured with a series of dummies (yes=1) for less than high school, high school, and some college/associates degree (bachelor's degree or more is the reference). Dummy variables are also included for *ethnicity* (Cajun=1), *race* (white=1), *religious affiliation* (Catholic=1) and *sex* (female=1). Finally, *age* is a continuous variable measured in years. Descriptive statistics for all variables used in our models are displayed in Table 5.

Table 5: Descriptive Statistics for COSS Variables used in Regression Models

Variables	Wave 1		Wave 2		Wave 3		Wave 4		Wave 5	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Dependent variable										
Negative mental health index	12.57	6.01	9.10	6.18	9.44	6.56	8.15	6.33	6.79	6.15
Independent variables										
Employment										
Oil and gas	0.71		0.59		0.64		0.60		0.56	
Fishing and seafood	0.62		0.53		0.56		0.49		0.44	
Community Sentiment	16.21	3.89	15.84	4.10	15.88	4.11	15.95	3.81	16.07	3.77
Proximity to coast	0.85	0.29	0.85	0.31	0.87	0.28	0.89	0.26	0.83	0.32
Length of residence	5.44	1.95	5.35	1.93	5.29	2.00	5.10	2.07	5.32	1.97
Employment status										
Full-time	0.51		0.52		0.46		0.51		0.50	
Part-time	0.07		0.10		0.09		0.06		0.04	
Retired	0.17		0.14		0.19		0.20		0.24	
Unemployed	0.09		0.10		0.10		0.07		0.07	
Not in labor force (ref)	0.16		0.13		0.16		0.16		0.15	
Educational attainment										
Less than high school	0.21		0.23		0.23		0.25		0.22	
High school	0.42		0.42		0.43		0.40		0.44	
Some college/assoc. deg.	0.20		0.21		0.20		0.21		0.20	
Bachelor’s deg. or more (ref)	0.18		0.14		0.14		0.14		0.15	
Cajun	0.28		0.33		0.49		0.59		0.52	
White	0.57		0.50		0.35		0.28		0.34	
Catholic	0.72		0.71		0.71		0.74		0.70	
Female	0.54		0.47		0.42		0.35		0.39	
Age	46.23	17.20	45.38	16.67	48.89	16.59	49.42	17.43	52.82	16.46
N	836		966		869		609		511	

3.9 Analytic Strategy

In the analysis that follows I employ the Hazards-of-Place analytic approach pioneered by Cutter et al. (2003) and elaborated on by others (e.g., Azar and rain 2007; Holand and Lujala 2013; Mendes 2009; Myers et al. 2008). Specifically, I use principle component factor analysis with varimax rotation to reduce the 20 aggregate-level predictor variables to a smaller set of underlying and independent dimensions of social vulnerability. In turn, I use the resulting dimension of social vulnerability to develop a cumulative SoVI for communities included in the COSS. Finally, with the SoVI as a guide, I estimate Ordinary Least Squares (OLS) regression models to test for relationships with negative affect.

3.10 Results

Results from the factor analysis are shown in Table 6. From the original 20 variables, a six-dimension factor structure emerges that accounts for 93.3% of variance among the areas included in this study. The emergent dimensions of social vulnerability include: (1) rural disadvantage, (2) dependent populations/economic disadvantage, (3) generalized instability, (4) elderly populations, (5) disadvantaged populations, and (6) mobile housing. Each of these six dimensions of social vulnerability is discussed in greater detail below.

Table 6: Social Vulnerability Index (SoVI)

Factor	Percent Variance Explained	Dominant variable
F1	24.9	Number of paid employees*
F2	17.0	Percent 5 years and younger
F3	15.6	Percent w/o H.S. diploma (25+)
F4	13.7	Percent 65 years and older
F5	12.1	Percent female-Headed Households
F6	10.0	Percent of housing units mobile homes

* Rescaled as their inverse (1/x)

3.11 Dimensions of Social Vulnerability: Rural Disadvantage

The first factor is noticeably related to patterns of rural disadvantage. Specifically, the following variables load positively on this factor: percentage of the population in poverty, the percent of the population receiving SNAP assistance, the number of paid employees (inverse), the annual payroll for commercial establishments (inverse), percent of workers employed in farming, fishing, and forestry occupations, percent of workers employed in construction, extraction, maintenance and repair occupations, and percent rural. This factor accounts for 24.9% of variance shown among variables in the model.

3.12 Dimensions of Social Vulnerability: Dependent Populations/Economic Disadvantage

The second factor to emerge represents a hybrid of vulnerability arising from dependent populations and economic disadvantage. Specifically, this factor is an amalgam of the following variables: the percentage of young children (under age 5), the percentage of the population that is unemployed (inverse), and the percentage households with incomes over $75,000 (inverse). This factor accounts for 17.0% of variance shown among variables in the model.

3.13 Dimensions of Social Vulnerability: Generalized Instability

The third factor relates to generalized instability in the geophysical and socioeconomic spheres. Four variables positively load on this factor: the percentage of the area that is land (inverse), the medium value of owner occupied housing (inverse), and the percentage of the population (age 25 and over) without a high school diploma, and the percentage of population change occurring between 2000 and 2010. This factor accounts for 15.6% of variance shown among variables in the model.

3.14 Dimensions of Social Vulnerability: Elderly Populations

The percent of the population over age 65, the percent of the population which are social security recipients, and the number of commercial establishments (inverse) all positively load positively on the fourth factor and account for 13.7% of variation shown among variables in the model.

3.15 Dimensions of Social Vulnerability: Disadvantaged Populations

The fifth factor clearly denotes disadvantaged populations. This is a hybrid factor where of the percent of the population that is white, non-Hispanic (inverse) and the percent of female-headed households both load positively. This factor accounts for 12.1 % of variance shown among variables in the model.

3.16 Dimensions of Social Vulnerability: Mobile Housing

The sixth and final factor corresponds to percentage of housing units that are mobile homes, which loaded positively. This factor accounts for 10.0% of variance shown among variables in the model.

3.17 Index of Social Vulnerability

Following the procedures established by Cutter et al. (2003) and employed by those who have elaborated on the Hazards-of-Place model (e.g., Azar and Rain 2007; Holand and Lujala 2013; Mendes 2009; Myers et al. 2008), factor scores for the six dimension of vulnerability were extracted and then summed to generate a cumulative SoVI score for each ZIP Code included in the study. SoVI scores for each of these localities are shown in Table 4. As was previously noted, Cutter et al. (2003: 254) opted to employ an additive measure of social vulnerability so as to allow research to be conducted without *a priori* assumptions regarding the importance of individual factors, thereby allowing each facet "an equal contribution to the [area's] overall vulnerability." As shown in Table 7, these data reveal SoVI ranges from 6.24 (high social vulnerability) to -3.44 (low social vulnerability) with a standard deviation of 2.45 for all ZIP Codes included in the COSS.

Table 7: Comparative Vulnerability

Zip Code	Principle Community	SoVI score	Level of Social Vulnerability
70345	Cut Off	-3.54	Low
70354	Galliano	-0.29	Moderate
70344	Chauvin	0.20	Moderate
70397	Theriot	0.58	Moderate
70377	Montegut	2.02	Moderate
70041	Buras	2.23	Moderate
70357	Golden Meadow	2.66	High
70353	Dulac	4.01	High
70083	Port Sulphur	5.37	High

Mean = 0.00 Standard Deviation = 2.45

Areas with SoVI scores beyond +1 standard deviation are identified as possessing high social vulnerability. Three of the nine areas included in this study (Dulac, Golden Meadow, and Port Sulphur) fall within these parameters. Conversely, areas demarked by a SoVI score of in excess of -1 standard deviation were labeled as the least vulnerable. Only one of the nine areas (Cut Off) was identified with a low SoVI. The SoVI scores for the remaining five areas (Buras, Chauvin, Galliano, Montegut, and Theriot) fell within one standard deviation of the mean; consequently they are identified as possessing moderate levels of social vulnerability.

3.18 Regression Analysis

To verify and explain observed differences in social vulnerability, Ordinary Least Squares (OLS) regression models are estimated to predict negative mental health impacts resulting from the BP-DH disaster. Separate models are specified for localities identified by low, mean, and high social vulnerability. These models, presented in Table 8, include the full range of control variables.

General patterns reported in all three models are consistent with Cope et al.'s (2013) findings and show, net of other factors, that (1) negative mental health impacts from the disaster are significantly lower in waves 2, 3, 4, and 5 when compared to the baseline, (2) households with ties to the fishing industry exhibit significantly higher levels of negative mental health impacts compared to others, and (3) other factors amplify or mute negative mental health impacts from the oil spill. However, as predicted by the Hazards-of-Place model, effects are not uniform across models for localities identified by low, mean, and high vulnerability.

Comparing across models, in all cases where coefficients in the high SoVI model are shown to be significantly different from corresponding coefficients in the other models a disadvantage is shown for people in high SoVI places in terms of negative affect. Specifically, in high SoVI places the effectiveness of resilience attributes are shown to be muted, while vulnerability attributes are shown to be amplified. Comparisons between low and moderate SoVI communities revealed more mixed results. However, there is less also clarity in interpreting these differences. Theory on this score is somewhat less clear as focus in typically on high vulnerability places. Moreover, this result could simply be the result of peculiarities of a low SoVI category that in this case only consists of a single place. Consequently additional research is needed to understand these relationships.

Table 8: SoVI-Specific OLS Regression Model Predicting Negative Mental Health Impacts

	Low SoVI				Mean SoVI				High SoVI			
Independent variables	*b*			SE	*b*			SE	*b*			SE
Time												
Wave 1 (reference)	---			---	---			---	---			---
Wave 2	-3.08	***		0.40	-3.46	***		0.25	-2.98	***		0.53
Wave 3	-3.26	***		0.41	-3.33	***		0.26	-2.51	***		0.55
Wave 4	-4.41	***		0.46	-4.70	***	‡	0.29	-2.63	***	§	0.67
Wave 5	-6.20	***	†	0.49	-5.05	***		0.32	-4.62	***	§	0.64
Employment												
Oil and gas	0.16		†	0.32	-0.50	**	‡	0.18	0.69			0.39
Fishing and seafood	1.94	***	†	0.29	3.13	***		0.18	3.20	***	§	0.41
Community Sentiment	-0.17	***	†	0.04	-0.25	***		0.02	-0.20	***		0.05
Proximity to coast	-0.17			0.09	-0.28	***		0.04	-0.35	***		0.09
Length of residence	-0.26		†	0.57	0.96	**		0.30	1.42	*	§	0.63

(Table 8 continued)

Independent variables	Low SoVI *b*			Low SoVI SE	Mean SoVI *b*			Mean SoVI SE	High SoVI *b*			High SoVI SE
Employment Status												
Full-time	-1.75	***		0.46	-1.39	***	‡	0.27	1.29	*	§	0.54
Part-time	-1.29			0.74	-0.51			0.37	-1.16			0.79
Retired	-1.81	**	†	0.58	-3.13	***	‡	0.34	-0.74			0.69
Unemployed	0.59			0.72	0.76	*		0.35	1.16			0.79
Not in labor force (reference)	---			---	---			---	---			---
Educational attainment												
Less than high school	2.18	***	†	0.52	0.91	**	‡	0.31	3.60	***	§	0.68
High school	0.84	*	†	0.36	-0.14		‡	0.28	1.95	**		0.64
Some college	0.78			0.41	0.34			0.31	1.20			0.71
Bachelor's degree + (reference)	---			---	---			---	---			---
Cajun	0.67			0.59	0.75	**	‡	0.27	3.25	***	§	0.53
White	0.14			0.59	-0.05		‡	0.27	2.70	***	§	0.50
Catholic	0.44			0.35	0.03			0.20	0.24			0.44
Female	1.32	***		0.29	0.80	***	‡	0.18	1.94	***		0.40
Age	-0.02		†	0.01	0.02	**		0.01	0.01		§	0.01
Intercept	15.31	***		1.22	15.11	***	‡	0.65	7.15	***	§	1.35
Adjusted R^2	0.19				0.22				0.23			
N	975				2263				553			

*p<.05; **p<.01; ***p<.001.

† corresponding coefficients in the Low SoVI and Mean SoVI models are significantly different (p < 0.05).

‡ corresponding coefficients in the Mean SoVI and High SoVI models are significantly different (p < 0.05).

§ corresponding coefficients in the High SoVI and Low SoVI models are significantly different (p < 0.05).

3.19 Discussion

The objective of this study was to explore the relationship between place-based social vulnerability and negative mental health impacts following the 2010 BP Deepwater Horizon oil spill. To attend to this objective, factor analysis was employed to identify the underpinning dimensions of social vulnerability at the ZIP Code level in areas of southeast Louisiana directly impacted by the BP-DH disaster. In turn, OLS regression techniques were used to parse out the relationship between the identified dimensions of social vulnerability and negative affect for individuals living in these locations.

The results reveal six specific dimensions of emplaced social vulnerability for the area included in this study. Specifically, these dimensions capture aspects of rural disadvantage, dependent populations/economic disadvantage, generalized instability, elderly populations, disadvantaged populations, and mobile housing.

Regression results show that, while in general, negative mental health impacts have become significantly less pronounced during later time points when compared to the onset of the BP-DH disaster, these patterns of improvement are not uniform across communities characterized by different levels of social vulnerability. This finding affirms the multidimensional nature of risk and disaster vulnerability (e.g., Chhotray and Few 2012; Cutter et al. 2003; Tierney 2006) and is understandable insofar as the later time points capture a context in which economic and environmental impacts of the spill have unfolded unevenly across places and populations.

The regression results, in general, are consistent with Cope et al.'s (2013) findings and show that levels of negative mental have significantly improved overtime, and that households with ties to the fishing and seafood industry consistently exhibit significantly higher levels of negative mental health compared to others. However, by incorporating Cutter et al.'s (2003) approach for assessing emplaced social vulnerability, as expected, shifts in negative mental health were shown to not be uniform for localities with divergent levels of social vulnerability. Specifically, the results show that in places identified with high levels of social vulnerability, the effectiveness of attributes associated with resilience were muted while the effect of vulnerability attributes were amplified.

This study has a general contribution to the extant literature on the sociology of disasters (e.g., Erikson 1976; Quarantelli 2005, 1989), with more specific contributions towards vulnerability to disaster related disruptions for individuals and communities tied to natural resource employment (e.g., Arata et al. 2000; Cope et al 2013; Dyer et al. 1992; Gill and Picou 2007; Ritchie and Gill 2010). Additionally, by building on Cutter et al.'s (2003) Hazards-of-Place based SoVI approach and linking it to previous research on oil spills (e.g., Cope et al. 2013; Gill et al. 2012; Lee and Blanchard 2012; Picou et al. 2004), this study provides an important linkage between these literatures. In particular, by building a vulnerability index based on ZIP Code level data, this analysis goes beyond previous research that uses counties/parishes as the unit of analysis (e.g., Cutter et al. 2003; Holand and Lujala 2013; Myers et al. 2008) which undoubtedly masked intra-county/parish variation in social vulnerability (and, presumably, resiliency). Furthermore, by incorporating the a more localized level of measurement in construing a vulnerability index, this analysis was able to provide a clearer understanding than previous research (e.g. Cope et al. 2013) of not only the impacts of the spill on the people in South Louisiana, but also how residents of communities identified with high social vulnerability had greater negative mental health impacts. The findings of this research stand to inform the scientific literature on disasters as well as evidence-based policy aimed at addressing the impacts of this disaster and those that will undoubtedly unfold in the future.

Despite these contributions, this study is not without limitations. For example, the use of aggregate data from the U.S. Census allowed for the identification of general trends and patterns in the areas included in the study; however, such measures are unable to capture the depth and richness that can be gained by employing a qualitative methodology. An in-depth case study of a community impacted by the BP-DH oil spill could potentially provide better information on the manner and ways in which vulnerability is manifested in the wake of disaster. Relatedly, while the cross-sectional trend data used in this study provides important insights, a panel design following the same respondents over time would allow researchers to better track the dynamics of vulnerability and resilience as the disaster process unfolds. And finally, this analysis did not consider the role of social networks, trust, or associational memberships (i.e., social capital), which has been identified as a significant resource for promoting resilience in disaster contexts (Ritchie, 2004; Ritchie and Gill, 2007). Future studies should seek to better understand the unique influences of social capital, emplaced vulnerability and natural resource employment in conceptualizing disaster resilience and vulnerability.

Cutter (1996: 537) envisioned place-based vulnerability as prompting "a feedback loop to both the risk and mitigation, which in turn further reduces or enhances both risk and mitigation." As such, this study has important implications in terms of public policy. First, it highlights the view that vulnerability to disaster related disruptions is influenced by the social characteristics of people and places. Disaster mitigation strategies have disproportionately concentrated on attending to biophysical issues (e.g., the construction/fortification of levees, seawalls, and beach nourishment to offset potential storm surge risks). However insofar as the risks, impacts, and costs of, and what qualifies as a disaster are all socially constructed, the findings from this study emphasize that disaster planning and mitigation efforts need to be conducted with an eye firmly attuned to the social characteristics of people and their communities. Relatedly, planners need to recognize that disaster processes are likely to have divergent long-term consequences for certain types of people emplaced in impacted areas. In the context of the BP-DH oil spill, specific policies need to be crafted that address the unique vulnerabilities faced by populations who maintain unique ties to threatened or damaged or resources. Likewise, planers need to take efforts to bolster those attributes that help to mute disaster related impacts (i.e., community sentiment), and devise mitigation efforts accordingly. Finally, this study highlights the need for planners to recognize disasters as processes that play out across time and place. By adopting a more holistic approach to understanding the multidimensional aspects of disaster processes, Cutter's place-based vulnerability “feedback loop” (1996: 537) can be better attended in order to limit inadvertently enhancing the risk in favor of mitigation.

3.20 References

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Chapter 4: Never Confuse a Single Impact with a Uniform Impact

There is a long-established relationship between experiencing a disaster and associated impacts to individual well-being such as, for example, elevated levels of stress as well as psychological and emotional problems (see e.g., Arata et al. 2000; Beiser, Wiwa, and Adebajo 2010; Lee and Blanchard 2012; Norris et al. 2008). To wit, researchers have advanced many explanations why this may be the case. For example, mental anguish may be tied to the loss of—or damage to—key resources on which the victim is reliant. In such cases, the ecological-symbolic approach to disasters (Kroll-Smith and Couch 1993, 1991) has been used to emphasize that community response to and recovery from a disaster is an interpretive processes influenced by the community's relationship to that environment and the manner in which damage was inflicted on the environment. Accordingly, residents of renewable resource communities (RRCs)—one "whose primary cultural, social, and economic existences are based on the harvest and use of renewable natural resources" (Picou and Gill 1996:881)—have been shown to be particularly vulnerable to disaster related disruptions (e.g., Cope et al. 2013; Gill et al. 2014). However, despite these findings, research conducted in the wake of disasters largely focuses on biophysical issues, while disproportionately ignoring disruption of environment-social relationships (Ritchie, Gill, and Picou 2011). Thus, it is incumbent on social scientists to identify differential impacts to the "human side" of environmental disasters. Accordingly, the purpose of the present study is to extend research on the social correlates of mental health impacts among residents of communities impacted by the 2010 BP Deepwater Horizon (BP-DH) oil spill.

While the populace of the United States' Gulf of Mexico region are relatively accustomed to natural disasters (e.g., hurricanes[2]), they were caught off-guard on April 20, 2010, when an explosion on the BP-leased Deepwater Horizon (BP-DH) oil drilling platform, sparked a series of events which resulted in the death of 11 workers, sinking of the structure, a three-month seafloor gusher that spewed crude oil at an approximated rate of 50,000 barrels a day, and culminated in what has been referred to as the "the worst environmental disaster" ever faced in the United States (Jackson 2010) and the largest recorded marine oil spill (Hamilton, Safford, and Ulrich 2012; Robertson and Krauss 2010). Directly impacted by the BP-DH disaster is a coastal region that is, by and large, made up of small communities and rural areas with strong economic ties to natural resource industries; such places have been shown to face unique disaster related vulnerabilities (Dyer, Gill, and Picou 1992; Flint and Luloff

[2] It is estimated that, on average, a given locality (within a 50 n mi. radius) along the gulf coast has experienced a hurricane every five to eleven years since the middle of the 19th century (Blake and Gibney 2011).

2005). Specifically, seafood and energy industries dominate the region, constituting a defining aspect of residents' economic and social identity (Freudenburg and Gramling 2011; Henry and Bankston 2002; Roebuck and Hickson 1982). Importantly, as a direct consequence of the BP-DH oil spill, both of these industries faced immediate and prolonged impacts. For example, workers in the oil and gas industries faced a 6 month moratorium on all deepwater offshore drilling on the Outer Continental Shelf and had to contend with an environment of stricter regulations once the moratorium was lifted. Analogously, fishing and seafood workers continue to face long-term threats and contamination of fishing grounds as well as consumers' perceptions regarding seafood safety.

The present article extends research on identifying how the contours of social life have been differentially impacted in the wake of the BP-DH disaster. Specifically, I seek to contribute to existing literature in various ways. First, by assessing impacts to mental health in the wake of the disaster, this research adds to the growing body of literature documenting shifts in well-being among residents of areas impacted by the BP-DH oil spill (e.g., Abramson et al. 2010; Lee and Blanchard 2012). An additional contribution is the consideration of impacts over time, which adds to the growing numbers of researchers and practitioners who contend that disasters should not be framed as a singular event but as an unfolding process (Kreps 1989; Smith and Wenger 2007). Further, in light of direct impacts faced by populations with ties to the oil/gas and fishing/seafood industries, and the important role such occupations have for the cultural and economic identities of residents of the region, I pay particular attention how ties to these industries promotes a unique vulnerability to mental health impacts (see e.g. Cope et al. 2013; Gill et al. 2014). Collectively, by addressing such issues, this study extends the general sociology of disaster literature (e.g., Chhotray and Few 2012; Quarantelli 2000) and contributes to a greater understanding of the patterns of vulnerability and resilience associated with technological disasters in particular (e.g., Abramson et. al 2014; Picou et al. 2004).

4.1 Conceptualizing Vulnerability to Disasters

From the outset of social scientific inquiry into disasters, researchers have endeavored to understand how "the essential functions of society" (Fritz 1961: 655) and social order can also be disrupted following hazardous events (e.g., Killian 1954; Wallace 1956). In time, a dynamic approach emerged that stressed "disasters" only occur as a consequence of collectively perceived disruptions to the normal social order and commonplace activities (e.g., Fritz and Marks 1954; Quarantelli and Dynes 1977). Accordingly, Quarantelli (2000: 682) describes disasters as a processes occurring when “the routines of collective social units are seriously disrupted and when unplanned courses of action have to be undertaken to cope with the crisis” (see also Brunsma and Picou 2008; Chhotray and Few 2012; Kreps 1998, 1989; Kreps and Drabek 1996; Smith and Wenger 2007).

As an inherently social process, differential susceptibility to disaster related disruptions surfaces as a consequence of “the various ways in which social systems operate to generate disasters by making people vulnerable” and by influencing “their capacity to anticipate, cope with, resist, and recover from the impact” of a hazard (Wisner et al. 2004:11). Researchers have theorized such susceptibility in terms of *social vulnerability* (e.g., Cutter, Boruff and Shirley 2003; Myers, Slack, Singelmann 2008; Norris et al. 2008; Tierney 2006), or as Cope et al. (2013: 873) describe, “a spectrum along which disaster impacts on the more socially disadvantaged (i.e., vulnerable) can be contrasted with the more socially advantaged (i.e., resilient).” To this end, in the wake of a disaster, the disruption process is intrinsically tied to systemic long-term antecedents as well as long-term consequences “which in turn may lead to still greater vulnerability should another hazard strike” (Chhotray and Few (2012: 696). Subsequently, regardless of the hazard agent that sparked the disruption process (e.g. geophysical, biological, environmental and technological hazards), a key consideration is how social dynamics influence the ways disaster impacts accumulate and unfold over time (e.g., Chhotray and Few 2012; Cope et al. 2013; Gill et al. 2014; Kroll-Smith and Couch 1990).

Throughout the disaster process, individuals may experience a wide range of loss in terms of health, family and friends, social support, financial well-being, sense of stability, property, and other valued resources (e.g., Bonanno et al. 2007; Hobfoll 2002). Consequently, as noted by Abramson et al. (2014: 46), impacted peoples face a similarly “wide range of psychological reactivity ranging from brief, transient distress to long-term psychopathology.” Such is the case following a technological disaster such as, large-scale oil spills where unique vulnerabilities have been documented amongst peoples who maintain economic, cultural and social ties with damaged environmental resources (e.g., Gill et al. 2014; Lee and Blanchard 2012; Picou and Gill 1996). While the specific ways in which disaster processes spur behavioral and mental health problems are difficult to uniformly pinpoint across all cases and contexts, many scholars have grounded their research in ecological-symbolic theory and the conservation-of-resources (COR) stress model.

Ecological-symbolic theory (Kroll-Smith and Couch 1993, 1991; see also Gill and Picou 1998) maintains that sociocultural and psychosocial interactions with an ecosystem influence community processes and structure. As such, communities whose social, cultural and economic continuation is tied to natural resources can experience lasting stress-related impacts when disaster processes contaminate or threaten the integral resource base. The COR stress model builds on ecological-symbolic theory and seeks to identify how residents of the same community are differentially vulnerable to disruptions in the natural resource base (Hobfoll, 2002, 1991, 1989). More specifically, the COR stress model maintains that people actively "strive to retain, protect, and build resources" Hobfoll (1989: 516). The model identifies four principal resources that serve as a means for acquiring other important assets: *energies* (e.g., money, time), *personal characteristics* (e.g., sense of self, orientation toward the world), *conditions* (e.g., roles, tenure), and *object resources* (e.g., home, boat). Accordingly, threats to, loss of, or interference with securing valued resources contribute to increased levels of distress and negative well-being. Indeed as a disaster unfolds, in some instances, an individual may endure substantial economic loss while, in other cases, resource loss is more keenly felt through disruptions to personal characteristics, social systems, and the ability to retain, protect, and build resources (Arata et al. 2000; Picou and Gill 1996).

The consideration of impacts over time is also a key consideration in the COR stress model. While negative outcomes often result from sort-term disruption to resources, more enduring and severe psychological and behavioral problems are likely to manifest following a period of prolonged distress and hindrance of coping resources (Abramson et al. 2014; Arata et al. 2000; Norris et al. 2008). Thus, according to the COR stress model, chronic resource loss coupled with an inability to garner new/alternative resources may result in a "loss cycle" in which people are "less likely to meet ongoing demands of stress or day-to-day adaptation" (Hobfoll and Lilly 1993: 132). Essentially, initial loss or resources begets vulnerability to additional losses. Such a conceptualization explains why, for example, for many years following the *Exxon Valdez* oil spill, prolonged psychological disruption continued to manifest in those tied to the fishing industry (e.g., Arata et al. 2000, Ritchie 2012). Indeed, beyond the *Valdez* example, the COR stress model has been as a template for understanding the social impacts of numerous disasters (e.g., Benight et al. 1999; Bonanno et al. 2007; Hobfoll, Canetti-Nisim, & Johnson 2006; Galea et al. 2008), including the BP-DH oil spill (e.g. Abramson et al. 2014; Buttke et al. 2012; Gill et al. 2014; Palinkas 2012).

4.2 Mental Health in the wake of the BP-DH oil spill

In the early months following the onset of the BP-DH disaster, media outlets were quick to take notice of emerging mental health and behavioral impacts (e.g., Mabus 2010; The Associated Press 2010; Walsh 2010), with many making comparisons to the impacts observed following the 1989 *Exxon Valdez* oil spill (EVOS) (e.g., Siegel 2010). Indeed, declines in overall emotional health were evident in an August 2010 Gallup Poll, conducted among residents of the Gulf Coast region, showing a 25.6% increase in clinical diagnoses of depression before and after the oil spill[3] (Winters 2010). While the impacts of the 2010 BP-DH oil spill continue to unfold, to date researchers and practitioners have already begun to observe and document shifts in mental health in the wake of the disaster (e.g., Abramson et al. 2010; Cope et al. 2013; Gill et al. 2012; Gill et al. 2014; Grattan et al. 2011; Lee and Blanchard 2012; Osofsky, Osofsky, and Hansel 2011). The findings from this initial research demonstrate a variety of adverse sociocultural and psychosocial impacts manifesting in the wake of the BP-DH oil spill, and highlight the value of a multiplicity of predictors (e.g., community attitudes and sentiments, natural resource ties, economic loss, and severity of impact) as social correlates of mental health impacts among residents of communities impacted by the oil spill. I outline some of the key findings from this growing body of research below.

Grounded in theoretical frameworks developed in the aftermath of the EVOS, Gill and his colleagues (2012, 2014) conducted research on mental health impacts following the BP-DH oil spill amongst residents of Mobile County, Alabama and made a comparison to the impacts experienced in the wake of the EVOS in Cordova, Alaska. In consideration of what factors contribute to mental anguish following an environmental disaster, this research drew upon the COR stress model, the interplay between social vulnerability and resource dependency, and perceptions of recreancy or "the failure of experts or specialized organizations to execute properly responsibilities to the broader collectivity with which they have been implicitly or explicitly entrusted" (Freudenburg 2000: 116). Findings indicate a similarity of initial disaster related psychological stress for those impacted by both oil spills, and highlight unique vulnerabilities stemming from sociocultural and economic ties to damaged and threated natural resources. Furthermore, this research underscores the importance of considering perceptions of recreancy as an additional predictor of mental health impacts following environmental disasters.

Research conducted by Grattan et al. (2011) to explore the relationship between community oil exposure and income loss revealed no significant differences between residents of Franklin County, Florida (indirectly exposed) and Baldwin County, Alabama, (directly exposed) in terms of psychological distress, resilience, coping, and risk perception experienced in the wake of the BP-DH disaster. The authors find that residents "who suffered

[3] While the Gallop Poll does not necessarily show direct correlation between the BP-DH oil spill and increases in clinical diagnoses of depression, it should be noted that there was no significant increase within comparable regions that did not experience the oil spill.

income losses as a result of the spill reported significantly more tension/anxiety, depression, anger, fatigue, confusion, and overall mood disturbance than their income-stable counterparts" (*ibid*: 842). Similarly, Osofsky et al (2011) found disruption to economic resources to be associated with negative metal health impacts, along with disruptions to personal, family and social life. Furthermore, both Grattan et al. (2011) and Osofsky et al. (2011) call for longitudinal studies to better identify and understand the range of social correlates impacting mental health and well-being throughout the disaster process.

From survey data gathered approximately two months after the onset of the spill—but while oil continued to actively gush from the blown well—Lee and Blanchard (2010) documented a variety of negative impacts on Gulf Coast residents, including disruptions to normal daily activities, more than doubling of self-rated stress levels, and higher levels of stress among individuals with strong ties to the fishing/seafood and oil/gas industries. Elsewhere, Lee and Blanchard (2012) documented a relationship between strong community attachment and increased levels of negative affective states (e.g. anger, anxiety, depression, fear, nervousness, sadness, worry, and excitement). Accordingly, the authors contend that social interactions that promote community attachment during crisis conditions "provided a unique set of crisis conditions" (*ibid*: 40) that fosters negative mental health and well-being. This work was extended by Cope et al. (2013) who found that, in contrast to the results reported by Lee and Blanchard (2012), community attachment is associated with better psychological health and well-being outcomes when longer time periods are considered; confirming positive community attitudes and sentiments to be an important to buffering negative impacts. Cope et al (2013), consistent with Lee and Blanched (2012) and other scholars addressing environmental disaster impacts on psychological health (e.g., Arata et al. 2000; Picou and Gill 1996), showed that households attached to the fishing and seafood industry exhibit uniquely high mental health impacts. Importantly, to assess levels of negative affect, Lee and Blanchard (2012) and Cope et al. (2013) examined multiple waves of trend data gathered during the first 12 months subsequent to the onset of the disaster. In this paper, I extend Lee and Blanchard's (2012) and Cope et al.'s (2013) analysis by 1) examining ongoing shifts in negative affect observed in trend data gathered between October, 2010 and April, 2013, and 2) through the inclusion of additional predictors of mental health drawn from the COR stress model and shown to be relevant in the wake of the BP-DH oil spill (e.g., income loss, ongoing disruption to personal and social life, and perceptions of recreancy).

4.3 Summary and Expectations

In summary, prior research has documented that communities are differentially susceptible to disaster related disruptions. Furthermore, within communities, particular social conditions and orientations may engender differential vulnerability for residents (e.g., households and individuals). Indeed, prior research indicates that as the disaster process unfolds over time, impacts to resources such as energies (e.g. money; time to participate in everyday activates) and personal characteristics (e.g., community attachment; perceptions of institutional malfeasance), mediate disaster related impacts. Additionally, in the context of a technological disaster, such as the Deepwater Horizon oil spill, where the natural resource base is negatively impacted, ecological-symbolic theory and the conservation-of-resources (COR) stress model suggest that community residents who rely more heavily on an intact natural resource base to earn their livelihood will be more likely to exhibit lasting impacts when disaster processes contaminate or threaten the integral resource base. Taking into consideration the protracted nature of the instigating event, and the amount of time that elapsed when the effects of the spill were still being experienced (e.g. contamination and closure of fishing grounds; oil on the wetlands and marshes for many months after the event; moratorium on all deepwater offshore drilling), I expect that as time passes, individuals who (1) are dependent on the natural resource base and (2) experienced direct impacts to personal resources will manifest divergent patterns of mental health impacts in the wake of the BP-DH disaster when compared to others. Below I detail the analytical methods that are used to test these expectations.

4.4 Research Questions

Given the literature outlined above, I ask the following research questions in relation to the impact of the BP-DH oil spill in Southeast Louisiana's coastal communities: (1) how has the level of self-reported negative mental health impacts changed over time; (2) how have reported levels of negative mental health differed for those with greater reported disruption to personal resources (e.g., energies, personal characteristics, conditions, and object resources); and (3) how do patterns differ for households with social, cultural, and economic ties to natural resource bases (i.e. fishing/seafood and oil/gas industries)?

4.5 Sample

To address the above research questions, I draw on data found in the Louisiana Community Oil Spill Survey (COSS). The COSS, repeated cross-sectional trend dataset, assess social impacts of the BP-DH disaster experienced by Louisiana's coastal residents living in areas directly affected by the spill. Administered by Louisiana State University's Public Policy Research Laboratory, the COSS is a telephone survey of households randomly drawn from a listed sample of the approximately 6,000 households living in the coastal zip codes of Lafourche, Plaquemines, and Terrebonne Parishes and the City of Grand Isle. The areas sampled in the COSS were chosen due to their direct geographic proximity to the BP-DH spill[4]. As trend data, the COSS affords the unique opportunity to examine social processes stemming from the BP-DH disaster. Thus the ability to transcend the study of a "singular event in time" makes the COSS ideal for addressing the questions laid out in this paper. Specifically, four waves of COSS data are utilized in the present analysis: a baseline gathered in October 2010 (the Macondo well was declared "effectively dead" in mid-September), with three additional waves collected in April 2011, April 2012, and April 2013 (corresponding to the one-year, two-year and three-year anniversary of the outset of the disaster). The respective response rates for each wave were 24 percent, 25 percent, 20 percent, and 19 percent. Such response rates are within the range typically obtained by leading survey organizations (e.g., Pew Research Center) and were obtained during adverse conditions (i.e. a disaster context). Furthermore, research has demonstrated little threat to the quality of survey estimates stemming from nonresponse bias within this range (e.g., Curtin, Presser, and Singer 2000; Groves 2006; Keeter et al. 2000; Keeter et al. 2006).

4.6 Dependent Variable

The dependent variable in my analysis is an index of negative mental health symptoms. Specifically, respondents were asked: "In the last week, how often have you experienced the following feelings because of the oil spill?'' (Responses included almost constantly, some of the time, almost never, and never). The list of feelings included is anger, anxiety, depression, fear, nervousness, sadness, and worry. Each item ranged from 0 to 3 where 0 = never and 3 = almost constantly. I created an index by summing the scores across all six indicators, resulting in a measure that ranges from 0 to 21. The reliability of the mental health scale is excellent (*alpha* = 0.92).

[4] At the onset of the disaster, the approximate location of the British Petroleum-leased Deepwater Horizon (BP-DH) oil rig was latitude 28° 44.20′ N and longitude 88° 23.23′ W or approximately 50 miles offshore of Southeast Louisiana.

4.7 Independent Variables

To measure disaster as a process, a key independent variable included in my analysis is *community change*. I measure time by pooling the four waves of survey data and creating dummy variables for the second, third, and forth waves (holding the baseline wave as the reference). Thus the coefficient for each dummy variable represents a measure of difference in negative mental health symptoms between the first wave (October 2010) and each of the subsequent waves of the COSS survey (April 2011, April 2012, and April 2013).

I include additional control variables commonly used in the literature on technological disasters, and justified by the COR stress model (Hobfoll, 2002, 1991), which postulates that individuals “strive to retain, protect, and build resources” (Hobfoll 1989: 516) in terms of *energies*, *personal characteristics*, *conditions*, and *object resources*.

Energies are resources identified by Hobbs (1989: 517) not in terms of intrinsic value, but as valuable in “the acquisition of other kinds of resources.” To that end, in the models that follow, I operationalize disaster related disruption of energies in terms of economic impacts and disruption of everyday routines. Using a 5-point ordinal scale where higher numbers indicate impact, respondents were asked to “describe the economic impact of the oil spill on your household.” Additionally, I include an index measuring the extent to which the disaster process has prevented respondents from having time to participate everyday routines. Specifically, six binary measures were obtained by asking respondents to indicate if “worry or concern over the spill prevented” them from getting a good night’s sleep; getting along well with friends; getting along with family members; taking care of their usual daily chores; being able to focus on their usual job or work; and being able to take care of their family as well as they would have liked (yes=1). An index was created by summing the scores across these six indicators, resulting in a measure that ranges from 0 to 6. Internal constancy for this measure is good (*alpha* = 0.81, *KR20* = 0.81).

As a resource, personal characteristics are measured in terms of *community attachment* and *respondents’ orientation towards the world*. To measure community attachment, I employ a six-item index to measure community attitudes and sentiments. Items included in the measure are drawn from the Knight Soul of the Community project, a research partnership between Gallup and the Knight Foundation (2012), and were previously used by Lee and Blanchard (2012) and Cope et al. (2013) in their investigations BP-DH disaster. Additionally, these measures are comparable to those used in previous research into the social correlates of disruption/change and community attachment (e.g. Brown 1993; Cope et al. 2015; Kasarda and Janowitz 1974; Smith, Krannich, and Hunter 2001). The index is comprised of the following items:

1. Taking everything into account, how satisfied are you with [name of community residence] as a place to live? (0 = *very dissatisfied*, 1 = *fairly dissatisfied*, 2 = *neither dissatisfied nor satisfied*, 3 = *fairly satisfied*, and 4 = *very satisfied*)
2. How likely are you to recommend [name of community residence] as a place to live? (0 = *extremely unlikely*, 1 = *somewhat unlikely*, 2 = *neither likely nor unlikely*, 3 = *somewhat likely*, and 4 = *extremely likely*)
3. Thinking about five years from now, how do you think [name of community residence] will be as a place to live compared to today? (0 = *Will be much worse*, 1 = *Will be somewhat worse*, 2 = *Will be about the same*, 3 = *Will be somewhat better*, and 4 = *Will be much better*)
4. Please indicate your agreement following statement: I am proud to say that I live in [name of community residence]. (0 = *strongly disagree*, 1 = *disagree*, 2 = *neither disagree nor agree*, 3 = *agree*, and 4 = *strongly agree*)
5. Please indicate your agreement with the following statement: [Name of community residence] is the perfect place for people like me. (0 = *strongly disagree*, 1 = *disagree*, 2 = *neither disagree nor agree*, 3 = *agree*, and 4 = *strongly agree*)
6. Overall, how would you rate your community as a place to live – excellent, good, only fair, or poor? (0 = *poor*, 1 = *fair*, 3 = *good*, and 4 = *excellent*)

Drawing on these six items, a summative index ranging from 0 to 24 was generated. The reliability of the community attachment scale is acceptable (*alpha* = 0.79).

Respondents' orientation toward the world is measured in terms of perception of recreancy. Specifically, I measure perceptions of distrust and blame of key governmental and organizational groups who maintain positions of responsibility to the larger collectivity. In terms of distrust, three binary measures were obtained by asking respondents to indicate if they "trust information regarding the oil spill" from BP, the federal government, and the state government (no=1). An index was created by summing the scores across these three indicators, resulting in a measure that ranges from 0 to 3. Internal consistency for this measure is acceptable (*alpha* = 0.72, *KR20* = 0.73). Likewise, three binary measures were obtained regarding blame by asking respondents who they "blame for the consequences of the oil spill, such as oil in the marsh, the moratorium on drilling and the closure of fisheries." Again, the responses were BP, the federal government, and the state government (yes=1). Ancillary analysis revealed unacceptable internal consistency (*alpha* = 0.48, *KR20* = 0.48) when using these measures to generate a summative index of perception of blame. Accordingly, a dummy measure was created measuring if the respondent blamed 2 or more the aforementioned institutional actors (yes=1).

I also include a range of additional control variables that address resources conceptualized as conditions and objects in the COR stress model. I measure *length of residence* as the proportion of one's life residing in the community (i.e., the quotient of the number of years resided in the community divided by age). *Educational* *attainment* is measured as the number of years of schooling respondents report having completed. *Employment status* is measured by two of dummy variables: for employed full-time or part-time (yes=1), and retired (yes=1) (unemployed or not in the labor force is the reference). Likewise, dummy variables included are *home ownership* (yes=1) and *marital status* (married or widowed=1).

I include six additional control variables suggested by previous literature. Specifically, I control for *number of children* living in the respondent's household, which is truncated at 6 or more; *proximity to the coast*, measured with an 8-point ordinal scale (larger values denote greater distance); dummy variables for *race* (white=1), *ethnicity* (Cajun=1), and *biological sex* (female=1); and I include *age* as a continuous variable measured in years. Additionally, I control whether or not a respondent's household includes members employed in a natural resource occupation. Specifically, dummy variables were created based on answers to the following questions (yes=1):"Do you or any member of your immediate family currently work in the fishing or seafood industries?" and "Do you or any member of your immediate family currently work in the oil industry?" Importantly, these are not mutually exclusive categories, given the possibility that a household could have members employed in the fishing *and* the oil industries. To that end, a third dummy variable is included for households employed in both the fishing and seafood industries *and* the oil industry (yes=1). Descriptive statistics for all variables are displayed in Table 9.These data are also broken down by survey wave and household ties to natural resource occupations presented in a corresponding supplementary analysis section at the end of this chapter.

Table 9:Means for Variables Included in Models by Survey Wave
(standard deviations in parentheses)

	October 2010	April 2011	April 2012	April 2013	Overall
Negative Mental Health Index	8.22	8.51	7.17	5.93	7.71
	(6.37)	(6.66)	(6.28)	(6.08)	(6.45)
Impact of the oil spill	3.90	3.95	3.73	3.72	3.85
	(1.08)	(1.08)	(1.09)	(1.04)	(1.08)
Disruption of everyday routines	2.29	2.11	1.79	1.24	1.96
	(2.07)	(2.08)	(1.93)	(1.67)	(2.02)
Community attachment	15.35	15.35	15.85	15.86	15.54
	(3.35)	(3.65)	(3.05)	(3.11)	(3.35)
Perceived distrust	1.82	1.90	1.82	1.74	1.83 (
	(1.14)	(1.10)	(1.15)	(1.25)	1.15)
Perceived blame	0.46	0.56	0.45	0.50	0.49

(Table 9 continued)

	October 2010	April 2011	April 2012	April 2013	Overall
Length of residence	0.83	0.85	0.87	0.80	0.84
	(0.31)	(0.27)	(0.27)	(0.31)	(0.29)
Educational attainment (0-18)	12.51	12.47	12.39	12.52	12.47
	(2.39)	(2.36)	(2.42)	(2.46)	(2.40)
Employment status: working (yes=1)	0.61	0.55	0.57	0.54	0.57
Employment status: retired (yes=1)	0.13	0.19	0.20	0.24	0.18
Home ownership	0.89	0.96	0.91	0.95	0.92
Marital Status	0.73	0.75	0.70	0.80	0.74
Number of kids in household	1.02	0.94	0.75	0.72	0.89
	(1.20)	(1.17)	(1.09)	(1.13)	(1.16)
Proximity to coast	5.35	5.32	5.11	5.36	5.29
	(1.91)	(1.99)	(2.03)	(1.95)	(1.97)
White	0.50	0.35	0.29	0.35	0.39
Cajun	0.34	0.50	0.58	0.51	0.47
Female	0.46	0.43	0.36	0.40	0.42
Age	44.63	48.67	49.26	52.54	48.04
	(16.45)	(16.64)	(17.55)	(16.43)	(16.96)
Household Type					
Involved in fishing/seafood	0.19	0.20	0.19	0.18	0.19
Involved in oil/gas	0.27	0.28	0.30	0.30	0.28
Involved in oil/gas & fishing/seafood	0.33	0.35	0.30	0.26	0.32
N	875	822	582	493	2772

4.8 Modeling strategy

To attend to my research questions, I specify ordinary least squares (OLS) regression models that predict negative mental health in the wake of the BP-DH oil spill. Due to differential probabilities in sample selection related to higher levels of nonresponse amongst certain segments of the population, these data are weighted by age and sex on the basis of the ratio of the distributions of these groups in the COSS versus those found from relevant zip codes based on the 2005-2009 American Community Survey.

4.9 Results

Table 10 presents the OLS regression estimates predicting negative mental health for the full sample. The first model is in essence a bivariate model, equivalent to an analysis of variance, includes only the dummy variables for each survey wave, and measures only shifts in the mean level of negative mental health over time. These results indicate that negative mental health impacts from the disaster are significantly lower in April 2012 and April 2013 than in October 2010. That is, unconditioned by other factors and relative to the early months of the BP-DH disaster, respondents report better mental health two and three years out from the spill. It should be noted, however, some of these effects are depressed in the second model, which includes all the resource variables—energies, personal characteristics—and the full range of control variables. Specifically, while the effects associated with wave 3 disappear in the second model, in both the conditional and unconditional models the mean level of negative mental health is significantly lower three years from the onset of the disaster.

Table 10: OLS Regression Models Predicting Negative Mental Health Impacts (Total Sample)

	b		SE	b		SE
Change Over Time						
Wave 1: Oct 2010 (reference)						
Wave 2: Apr 2011	0.29		0.22	0.15		0.18
Wave 3: Apr 2012	-1.06	***	0.24	-0.22		0.20
Wave 4: Apr 2013	-2.29	***	0.26	-0.65	**	0.22
Resource: Energies						
Impact of the oil spill				0.75	***	0.07
Disruption of everyday routines				1.27	***	0.04
Resource: Personal Characteristics						
Community attachment				-0.17	***	0.02
Perceived distrust				0.86	***	0.06
Perceived blame				0.66	***	0.14
Control Variables						
Resource: Conditions and Objects						
Length of residence				0.80	**	0.25
Educational attainment (0-18)				-0.18	***	0.03
Employment status: working (yes=1)				-1.26	***	0.18
Employment status: retired (yes=1)				-1.38	***	0.26
Home ownership				0.26		0.28
Marital Status				-0.12		0.18
Additional Controls						
Number of kids in household				0.31	***	0.07
Proximity to coast				-0.08	*	0.04
White				0.14		0.22
Cajun				0.57	**	0.22
Female				1.37	***	0.15
Age				0.03	***	0.01
Household Type						
Fishing/seafood				1.83	***	0.23
Oil/gas				-0.46	*	0.21
Oil/gas & fishing/seafood				0.77	***	0.21
Intercept	8.22	***	0.15	3.11	***	0.73
N	2,772			2,772		
Adj. R2	0.02			0.37		
F	37.24			138.45		
P	<.001			<.001		

*p<.05; **p<.01; ***p<.001.

In regards to the remaining variables included in the second model, as expected, several of the predictors are shown to have a significant relationship with disaster related negative mental health impacts. For the sake of brevity, I restrict discussion in the prose to the findings associated with the measures of resources and household ties to natural resource extractive industries. With regards to energy resources, as expected, in the wake of the disaster, loss of economic and time related energies are significantly associated with higher levels of negative mental health. In terms of personal characteristics resources, the model shows results consistent with expectations. The results show that while higher levels of community attachment are significantly associated with lower levels of negative mental health impacts, increased perceptions of distrust and blame of key governmental and organizational groups are significantly associated with higher levels of negative mental health impacts. Last, the model shows that, compared to those without ties to natural resource industries, households with ties to the fishing/seafood industry, as well as households with ties to both the fishing/seafood and oil/gas industries, exhibit higher levels of negative mental health, while households with ties to only the oil/gas industry show lower levels of negative affect compared to others.

To assess the extent to which negative mental health impacts vary for respondents with social, cultural, and economic ties to natural resource bases, unconditional and conditional OLS regression models were estimated based on household involvement in 1) the fishing/seafood industry; 2) the oil/gas industry; 3) both the fishing/seafood and the oil/gas industries; and 4) neither the fishing/seafood or the oil/gas industries. Table 11 presents the OLS regression estimates predicting negative mental health for households with ties to the fishing/seafood industry. The unconditional model shows significant improvement in negative mental health in April 2013 compared to October 2010; however in the conditional model this effect disappears and significantly higher levels of negative mental health are noted in April 2011. Thus, in this sample, mental health impacts from the BP-DH oil spill vary over time for respondents with ties the fishing/seafood industry. The results also show that greater disruption of everyday routines and higher levels of perceived distrust and blame are associated with significantly higher negative mental health impacts. Community attachment is the only resource shown to significantly lower disaster related negative mental health impacts for respondents residing in households with ties to the fishing/seafood industry. All results shown in the conditional model are consistent with expectations.

Table 11: OLS Regression Models Predicting Negative Mental Health Impacts for Households with ties to the Fishing/Seafood Industry

	b		SE	b		SE
Change Over Time						
Wave 1: Oct 2010 (reference)						
Wave 2: Apr 2011	0.77		0.49	1.24	**	0.43
Wave 3: Apr 2012	-0.63		0.54	0.62		0.46
Wave 4: Apr 2013	-3.37	***	0.60	-0.47		0.54
Resource: Energies						
Economic Impact				0.17		0.14
Disruption of everyday routines				1.50	***	0.09
Resource: Personal Characteristics						
Community attachment				-0.17	**	0.05
Perceived distrust				0.74	***	0.15
Perceived blame				0.84	*	0.34
Control Variables						
Resource: Conditions and Objects						
Length of residence				1.20	*	0.61
Educational attainment (0-18)				-0.10		0.08
Employment status: working (yes=1)				-0.60		0.39
Employment status: retired (yes=1)				0.82		0.60
Home ownership				-0.46		0.57
Marital Status				0.86	*	0.40
Additional Controls						
Number of kids in household				0.05		0.16
Proximity to coast				-0.01		0.08
White				1.04	*	0.48
Cajun				1.54	**	0.48
Female				1.68	***	0.34
Age				-0.03	*	0.01
Intercept	10.63	***	0.49	5.73	**	1.68
N	521			521		
Adj. R2	0.04			0.35		
F	15.95			28.87		
P	<.001			<.001		

*p<.05; **p<.01; ***p<.001.

Table 12 presents the OLS regression estimates predicting negative mental health for households with ties to the oil/gas industry. In the unconditional model, negative mental health impacts are significantly lower in April 2012 and in April 2013 compared to October 2010. While 2012 goes away, the pattern of improved mental health in April 2013 for those with ties to the oil/gas industry persists when other variables are controlled for, indicating that, in this sample, mental health impacts from the BP-DH oil spill vary over time for respondents with ties to the oil/gas industry. The conditional model also shows greater disruptions to energies resources and increased perceptions of distrust and blame are associated with significantly higher negative mental health impacts, while community attachment significantly lower disaster related negative mental health impacts for respondents residing in households with ties to the oil/gas industry.

Table 12: OLS Regression Models Predicting Negative Mental Health Impacts for Households with Ties to the Oil/Gas Industry

	b		SE	b		SE
Change Over Time						
Wave 1: Oct 2010 (reference)						
Wave 2: Apr 2011	0.39		0.39	-0.04		0.33
Wave 3: Apr 2012	-1.34	**	0.41	-0.39		0.35
Wave 4: Apr 2013	-2.04	***	0.45	-1.03	**	0.38
Resource: Energies						
Impact of the oil spill				1.31	***	0.14
Disruption of everyday routines				0.92	***	0.07
Resource: Personal Characteristics						
Community attachment				-0.18	***	0.04
Perceived distrust				1.11	***	0.11
Perceived blame				0.51	*	0.25
Control Variables						
Resource: Conditions and Objects						
Length of residence				-0.16		0.45
Educational attainment (0-18)				-0.16	**	0.06
Employment status: working (yes=1)				-1.51	***	0.36
Employment status: retired (yes=1)				-1.85	***	0.49
Home ownership				0.36		0.59
Marital Status				-1.55	***	0.36
Additional Controls						
Number of kids in household				0.17		0.14
Proximity to coast				0.01		0.07
White				-0.27		0.53
Cajun				0.19		0.53
Female				1.15	***	0.28
Age				0.04	**	0.01
Intercept	6.59	***	0.26	2.32		1.48
N	824			824		
Adj. R2	0.02			0.34		
F	12.77			40.39		
P	<.001			<.001		

*p<.05; **p<.01; ***p<.001.

Table 13 presents the OLS regression estimates predicting negative mental health for households with ties to the both the fishing/seafood and oil/gas industries. Similar to the pattern shown in Tables 11 and 12, in the unconditional model, negative mental health impacts are significantly lower in April 2012 and in April 2013 than in October 2010. Most of these effects disappear, however, in the conditional model. This finding suggests that, when compared to households with ties to the fishing/seafood industry and households with ties to the oil/gas industry, mixed industry households occupy a “middle ground” in terms of vulnerability to mental health impacts. Disruption of energy resources and increased perception of distrust and blame are all shown to be associated with significantly higher negative mental health impacts in the conditional model for respondents residing in households with ties to the both the fishing/seafood and oil/gas industries. Conversely, higher levels of community attachment are associated with lower levels of negative mental health impacts stemming from the BP-DH oil spill.

Table 13: OLS Regression Models Predicting Negative Mental Health Impacts for Households with ties to both Fishing/Seafood and Oil/Gas Industries

	b		SE	b		SE
Change Over Time						
Wave 1: Oct 2010 (reference)						
Wave 2: Apr 2011	0.05		0.39	-0.17		0.32
Wave 3: Apr 2012	-1.15	**	0.44	-0.70		0.37
Wave 4: Apr 2013	-1.59	**	0.51	-0.34		0.43
Resource: Energies						
Economic Impact				0.66	***	0.12
Disruption of everyday routines				1.36	***	0.07
Resource: Personal Characteristics						
Community attachment				-0.24	***	0.04
Perceived distrust				0.80	***	0.12
Perceived blame				0.90	**	0.26
Control Variables						
Resource: Conditions and Objects						
Length of residence				1.04		0.54
Educational attainment (0-18)				-0.35	***	0.06
Employment status: working (yes=1)				-1.55	***	0.34
Employment status: retired (yes=1)				-2.51		0.52
Home ownership				-0.11		0.55
Marital Status				0.56	**	0.33
Additional Controls						
Number of kids in household				0.39		0.12
Proximity to coast				-0.09		0.06
White				0.49		0.39
Cajun				0.92	*	0.37
Female				1.54	***	0.29
Age				0.04	**	0.01
Intercept	9.15	***	0.23	6.28	***	1.35
N	830			830		
Adj. R2	0.01			0.36		
F	5.56			49.36		
P	<.001			<.001		

*p<.05; **p<.01; ***p<.001.

Table 14 presents the OLS regression estimates predicting negative mental health for households with no ties to the fishing/seafood or the oil/gas industries. Negative mental health impacts are significantly lower in April 2013 than in October 2010 in the unconditional model, however in the conditional model this effect disappears. Disruptions to energies resources and increased perceptions of distrust are shown to be associated with significantly higher negative mental health impacts. Diverging from the previous models, no significant relationship between negative mental health and increased perceptions of blame was detected.

Table 14: OLS Regression Models Predicting Negative Mental Health Impacts for Households with no ties to Fishing/Seafood or Oil/Gas Industries

	b		SE	b		SE
Change Over Time						
Wave 1: Oct 2010 (reference)						
Wave 2: Apr 2011	-0.47		0.47	-0.15		0.41
Wave 3: Apr 2012	-0.50		0.49	-0.18		0.43
Wave 4: Apr 2013	-1.66	**	0.49	-0.58		0.43
Resource: Energies						
Economic Impact				1.06	***	0.16
Disruption of everyday routines				1.25	***	0.09
Resource: Personal Characteristics						
Community attachment				-0.09		0.05
Perceived distrust				0.78	***	0.13
Perceived blame				0.25		0.32
Control Variables						
Resource: Conditions and Objects						
Length of residence				1.68	***	0.47
Educational attainment (0-18)				-0.01		0.06
Employment status: working (yes=1)				-0.61		0.40
Employment status: retired (yes=1)				-0.81		0.51
Home ownership				1.69	**	0.55
Marital Status				-1.26	**	0.40
Additional Controls						
Number of kids in household				0.66	***	0.15
Proximity to coast				-0.30	***	0.08
White				-0.99	*	0.45
Cajun				-0.97	*	0.44
Female				1.15	***	0.30
Age				0.04	**	0.01
Intercept	6.60	***	0.30	-1.17		1.52
N	597			597		
Adj. R2	0.01			0.31		
F	7.79			25.93		
P	<.05			<.001		

*p<.05; **p<.01; ***p<.001.

To assess variability in the coefficients across the four conditional models, I tested for significant differences in the coefficients between the models using the technique described by Paternoster et al. (1998). Accordingly, z-scores denoting differences between regression coefficients for conditional models in Tables 11-14 are presented in Table 16 in the supplementary analysis section at the end of this chapter. When comparing the coefficients across all four models the effects for fishing/seafood households are shown to be significantly different from other types of households in many instances. For fishing/seafood households negative affect was more pronounced one year out from the spill (April 2011) compared to other household types. Fishing/seafood households continue to be significantly worse off than mixed industry households two years out (April 2012). Similarly, fishing/seafood households show greater negative affect associated with disruption of everyday activities compared to oil/gas households as well as households with no ties to the fishing/seafood or the oil/gas industries. However, paradoxically the positive relationship between economic impacts and negative affect is more pronounced among all other households compared to e fishing/seafood households. This finding is difficult to interpret. It could reflect in part more immediate economic impacts of the drilling moratorium and impacts on tourism, while some fishers earned money in cleanup efforts and through other mechanisms, but this is speculative and requires further scrutiny. In fact, it is oil/gas and other industry households that report the most pronounced relationship with negative affect and economic impact. Last, when comparing the coefficients across all four models, it is notable that perceptions of distrust and blame were the only resource variables where there are no significant differences between one or more of the models; indicating a uniformity of effect for these variables across the four household types when all other covariates are accounted for. To a lesser degree community attachment also showed near uniformity of effect across models (significantly different for households with mixed industry ties and those with ties to other industries).

4.10 Discussion

This study set out meet three objectives pertaining to impacts stemming from the 2010 BP-DH oil spill. The first objective was to assess how the level of self-reported negative mental health impacts among residents of affected areas of Southeast Louisiana changed over time. I find that, as a whole, respondents reported significantly worse levels of mental well-being during in October 2010 compared to April, 2012 and April, 2013. This finding is reasonable, and expected, insofar as the baseline COSS data was gathered weeks after the blown Macondo well was declared “effectively dead” in mid-September and the disaster catalyst was still in motion (i.e. oil continued to threaten and contaminate the biophysical environment), while COSS data gathered at later dates reflect a time when media attention had by and large died down, and the economic and environmental impacts unfolded unevenly throughout the region. Importantly, these findings further vindicate the importance of the considering disaster impacts not as something tied to a singular event *in* time, but rather as a part of a process that unfolds *over* time (e.g., Brunsma and Picou 2008; Chhotray and Few 2012; Kreps 1998; Kreps and Drabek 1996; Smith and Wenger 2007). With economic and environmental impacts stemming from the BP-DH oil spill still unfolding, it is too soon to ascertain the long-term consequences of the disaster on mental well-being. Indeed, insofar as a disruption process my generate greater vulnerabilities in the face of another hazard (Chhotray and Few 2012), there is a need for continued study to better understand the full range of social correlates impacting mental health in the wake of the BP-DH disaster.

The second objective of the study was aimed at an empirical assessment of how reported levels of negative mental health differed for those with greater reported disruption to personal resources (e.g., energies, personal characteristics). These data show that, with the exception of greater levels of community attachment (a personal characteristic resource) being linked to lower levels of negative health impacts, respondents, as a whole, who reported negative impacts of personal resources and increased perceptions of blame and distrust of key institutional actors are significantly more likely exhibit higher levels of negative health impacts in the wake of the BP-DH oil spill. These findings are indicative of numerous disaster studies and supports the view that (1) disaster related resource loss contributes to social vulnerability, (2) community attachment represents a significant aspect of disaster resiliency, and (3) perceptions of recreancy (e.g., blame and distrust) is a potential hindrance to disaster recovery (e.g., Buttke et al. 2012; Gill et al. 2014; Hobfoll 2002; Lee and Blanchard 2012; Norris et al. 2008).

The final objective was to establish if patterns of negative mental health impacts differ for households with social, cultural, and economic ties to natural resource bases (e.g., fishing/seafood and oil/gas industries) compared to others. In this regard, I find evidence that households with ties to the fishing/seafood industry faced especially negative health impacts in the wake of the BP-DH oil spill. This finding is consistent with research that has shown fishers face unique vulnerabilities to psychological impacts in the wake of disasters such as the BP-DH oil spill and the EVOS (e.g., Arata et al. 2000; Cope et al. 2013; Gill et al. 2014; Lee and Blanchard 2012). The ongoing and uniquely negative impacts faced by fishers is understandable and to be expected. Indeed such houses not only have to contend with the immediate and future environmental impacts to the resource base upon which these households rely, but they will have to cope with an economic market imbued with negative perceptions regarding product safety. Vulnerabilities experienced by some but not all members of the community can result in additional sever and long-term disruptions while simultaneously eroding the “mortar boding human communities together” (Erikson 1994: 239) and corroding ontological security (Giddens 1990).

Interestingly, I found that the effect of perceptions of recreancy on negative mental health did not differ in any meaningful way for households with differing social, cultural, and economic ties to natural resource bases. This is important for several reasons. First, perceptions of recreancy introduce toxicity to the social fabric that has the potential to disaffects community members from one another, thereby corroding the capability if institutions to mitigate and manage risks (Fowlkes and Miller 1987; Freudenburg 2001). Second, in the wake of a technological disaster, perceptions of recreancy have been shown to be potential source of stress and additional social disruptions (e.g., Buttke et al. 2012; Gill et al. 2014). Last, while not directly addressed in this paper, a convergence of data from research on the Exxon Valdez oil spill shows that perceptions of recreancy promote a "social responses that draw down reserves of social capital, setting the stage for the emergence of individual and collective trauma, lifestyle and lifescape change, a corrosive community, and secondary trauma" (Ritchie et al. 2013: 658).

In general, this study contributes to the social scientific literature on disasters (e.g., Chhotray and Few 2012; Quarantelli 2000), advances understanding pertaining to patterns of vulnerability associated with technological disasters in particular (e.g., Abramson et. al 2014), and more specifically adds to literature on oil spill related disaster related processes (e.g., Picou et al 2004; Ritchie 2012) including the growing body of literature documenting shifts in well-being among residents of areas impacted by the BP-DH oil spill (see e.g., Abramson et al. 2010; Gill et al. 2014; Grattan et al. 2011; Osofsky, Osofsky, and Hansel 2011). Furthermore, this research aligns with other literature which shows populations with distinct sociocultural and psychosocial ties to renewable resource industries face unique vulnerabilities to stress and negative impacts in the wake of a disaster (see e.g., Arata et al. 2000; Gill et al. 2012). Moreover, I extend the work conducted by Lee and Blanchard (2012) and Cope et al. (2013) who used COSS data collected during the first 12 mounts following the onset of the BP-DH disaster to study mental health impacts. I build on this research by showing higher levels of community attachment to be significantly associated with lower levels of negative mental health impacts over time. While this finding is consistent with Cope et al.'s (2013) research on mental health impacts experienced in the first year of the BP-DH disaster, and in contrast to the outcomes reported by Lee and Blanchard's (2012) investigation of impacts experienced while oil continued to actively gush from the blown well. It should be noted that ancillary analysis on whether the effects of community attachment on mental health differ over time showed a significant negative relationship associated with wave 2, no significance in relation to wave 3, and a marginal relationship ($p=0.059$) with wave 4. This finding suggests that community attachment is linked to better psychological health outcomes, but that this relationship may ebb and flow as the disaster unfolds over time; additional research is needed to disentangle why this may be the case.

Despite these contributions, this study has its limitations. For example, research conducted in the wake of the Exxon Valdez oil spill shows that psychological stress became chronic due to litigation protracted since its onset in 1989 (e.g., Picou et al 2004). Indeed, Picou et al. (2004) found that involvement in the litigation process stimulated higher levels of psychological distress in Cordova than the spill event itself. Given the generic similarities between the BP-DH oil spill and Exxon Valdez oil spill (e.g., Siegel 2010), psychological recovery may in part be intertwined with litigation and compensation practices (Gill et al. 2014). Accordingly, future research should incorporate uncertainty surrounding legal actions and their influences on mental well-being. Additionally, while the cross-sectional trend data used in this study allowed shifts in disaster related mental health impacts to be studied over time, future research should consider panel study design to identify the nuanced social dynamics that can influence these impacts throughout the disaster process. Lastly, future research should consider how disaster impacted individuals directly replace, and when not possible symbolically replace, threatened and depleted resources.

Bringing the discussion full circle, I reiterate that the populace of the United States' Gulf of Mexico region routinely faces disaster related disruptions (e.g. Blake and Gibney 2011), and that impacts from one event can engender higher levels of vulnerability when another hazard strikes (e.g. Chhotray and Few 2012). To wit, this research has the potential to inform public policy and mitigation strategies in several important ways. For example, this research highlights the need to understand disasters not in terms of a singular event *in* time, but rather as a process that unfolds *over* time. Relatedly, this research underscores that disaster processes are inherently tied to preexisting social phenomena, and as such certain types of people may face uniquely negative consequences in affected areas. Specifically, mitigation planning should be attuned to the well-being of disaster impacted populations who hold distinct sociocultural and psychosocial ties to damaged or threatened resources. Further, personal characteristics—such as community attachment and perceptions of recreancy—may mute or amplify negative disaster impacts. Accordingly, individual attributes should be included, along with collective attributes, as a key component in disaster mitigation strategies.

4.11 Supplementary Analysis

Descriptive statistics for all variables are broken down by survey wave and household ties to natural resource occupations presented in Table 15. Additionally, Table 16 presents z-scores denoting differences between regression coefficients for conditional models previously shown in Tables 11-14.

Table 15: Means for variables included in models by survey wave and household type
(standard deviations in parentheses)

	October 2010				
	Fishing/seafood	Oil/ gas	Fishing/seafood and oil/gas	Other	Overall
Negative Mental Health Index	10.63 (6.10)	6.59 (5.95)	9.15 (6.60)	6.60 (5.72)	8.22 (6.37)
Economic Impact	3.97 (1.10)	3.85 (1.04)	4.10 (1.09)	3.58 (1.03)	3.90 (1.08)
Disruption of everyday routines	2.93 (2.02)	1.96 (1.96)	2.44 (2.11)	1.85 (2.02)	2.29 (2.07)
Community attachment	15.03 (3.52)	16.63 (3.14)	15.44 (3.15)	15.13 (3.74)	15.35 (3.35)
Perceived distrust	1.97 (1.11)	1.76 (1.08)	1.96 (1.10)	1.54 (1.24)	1.82 (1.14)
Perceived blame	0.48	0.46	0.49	0.39	0.46
Proportion of life as resident	0.89 (0.24)	0.82 (0.33)	0.89 (0.25)	0.70 (0.39)	0.83 (0.31)
Educational attainment (0-18)	12.24 (2.47)	12.92 (2.27)	12.35 (2.37)	12.45 (2.44)	12.51 (2.39)
Employment status: working (yes=1)	0.55	0.67	0.66	0.52	0.61
Employment status: retired (yes=1)	0.12	0.14	0.09	0.20	0.13
Home ownership	0.85	0.90	0.92	0.85	0.89
Marital Status	0.69	0.81	0.74	0.63	0.73
Number of kids in household	1.01 (1.14)	0.91 (1.01)	1.14 (1.30)	0.95 (1.29)	1.02 (1.20)
Proximity to coast	4.68 (1.99)	5.79 (1.29)	5.17 (1.96)	5.70 (1.82)	5.35 (1.91)
White	0.54	0.56	0.41	0.53	0.50
Cajun	0.34	0.35	0.36	0.29	0.34
Female	0.48	0.46	0.41	0.52	0.46
Age	43.10 (15.59	46.22 (16.27)	43.95 (15.37)	45.06 (18.89)	44.63 (16.45)
N	161	250	280	184	875

(Table 15 continued)

	April 2011				
	Fishing/seafood	Oil/ gas	Fishing/seafood and oil/gas	Other	Overall
Negative Mental Health Index	11.40 (6.55)	6.97 (6.09)	9.19 (6.74)	6.14 (5.95)	8.51 (6.66)
Economic Impact	3.96 (1.23)	4.06 (0.95)	4.00 (1.13)	3.67 (0.92)	3.95 (1.08)
Disruption of everyday routines	2.87 (2.05)	1.75 (2.05)	2.43 (2.08)	1.10 (1.67)	2.11 (2.08)
Community attachment	15.70 (3.18)	15.33 (3.96)	15.21 (3.77)	15.28 (3.46)	15.35 (3.65)
Perceived distrust	1.95 (1.14)	1.74 (1.12)	2.09 (1.02)	1.70 (1.15)	1.90 (1.10)
Perceived blame	0.51	0.58	0.62	0.45	0.56
Proportion of life as resident	0.82 (0.29)	0.85 (0.28)	0.91 (0.22)	0.78 (0.31)	0.85 (0.27)
Educational attainment (0-18)	11.40 (1.91)	13.10 (2.30)	12.25 (2.26)	13.16 (2.60)	12.47 (2.36)
Employment status: working (yes=1)	0.43	0.56	0.64	0.47	0.55
Employment status: retired (yes=1)	0.17	0.21	0.13	0.30	0.19
Home ownership	0.94	0.98	0.95	0.97	0.96
Marital Status	0.68	0.87	0.71	0.74	0.75
Number of kids in household	1.05 (1.28)	0.72 (1.02)	1.06 (1.19)	0.91 (1.19)	0.94 (1.17)
Proximity to coast	4.92 (2.05)	5.48 (1.82)	5.23 (2.07)	5.75 (1.89)	5.32 (1.99)
White	0.33	0.39	0.32	0.34	0.35
Cajun	0.41	0.56	0.52	0.50	0.50
Female	0.42	0.53	0.33	0.51	0.43
Age	47.08 (17.40)	50.85 (15.90)	45.89 (15.78)	52.85 (17.39)	48.67 (16.64)
N	159	245	258	160	822

(Table 15 continued)

April 2012

	Fishing/seafood	Oil/ gas	Fishing/seafood and oil/gas	Other	Overall
Negative Mental Health Index	10.00 (6.13)	5.25 (5.80)	7.99 (6.28)	6.10 (5.92)	7.17 (6.28)
Economic Impact	3.79 (1.31)	3.66 (0.95)	3.83 (1.16)	3.64 (0.94)	3.73 (1.09)
Disruption of everyday routines	2.36 (2.02)	1.25 (1.70)	2.25 (2.00)	1.35 (1.71)	1.79 (1.93)
Community attachment	16.08 (2.92)	16.06 (2.59)	16.19 (2.83)	14.86 (3.50)	15.85 (3.05)
Perceived distrust	1.97 (1.17)	1.70 (1.17)	1.95 (1.07)	1.66 (1.18)	1.82 (1.15)
Perceived blame	0.44	0.47	0.50	0.34	0.45
Proportion of life as resident	0.88 (0.26)	0.88 (0.26)	0.89 (0.26)	0.81 (0.28)	0.87 (0.27)
Educational attainment (0-18)	11.71 (2.32)	13.24 (2.27)	11.83 (2.45)	12.60 (2.30)	12.39 (2.42)
Employment status: working (yes=1)	0.50	0.62	0.66	0.42	0.57
Employment status: retired (yes=1)	0.16	0.20	0.16	0.30	0.20
Home ownership	0.89	0.93	0.91	0.88	0.91
Marital Status	0.77	0.76	0.68	0.59	0.70
Number of kids in household	0.87 (1.24)	0.68 (1.02)	0.86 (1.17)	0.57 (0.89)	0.75 (1.09)
Proximity to coast	4.67 (2.24)	5.60 (1.88)	4.89 (2.12)	5.31 (1.70)	5.11 (2.03)
White	0.36	0.29	0.24	0.28	0.29
Cajun	0.47	0.63	0.61	0.60	0.58
Female	0.40	0.34	0.34	0.38	0.36
Age	48.78 (18.06)	49.49 (17.17)	48.87 (16.24)	49.91 (19.43)	49.26 (17.55)
N	111	172	177	122	582

(Table 15 continued)

	April 2013				
	Fishing/seafood	Oil/ gas	Fishing/seafood and oil/gas	Other	Overall
Negative Mental Health Index	7.26 (6.51)	4.55 (5.32)	7.56 (6.39)	4.95 (5.72)	5.93 (6.08)
Economic Impact	3.75 (1.15)	3.67 (0.95)	3.95 (1.18)	3.51 (0.85)	3.72 (1.04)
Disruption of everyday routines	1.62 (1.67)	0.93 (1.42)	1.76 (1.82)	0.81 (1.57)	1.24 (1.67)
Community attachment	16.45 (2.89)	16.06 (3.20)	15.90 (3.13)	15.18 (3.03)	15.86 (3.11)
Perceived distrust	1.86 (1.27)	1.66 (1.23)	1.77 (1.30)	1.70 (1.21)	1.74 (1.25)
Perceived blame	0.39	0.47	0.57	0.52	0.50
Proportion of life as resident	0.74 (0.36)	0.83 (0.30)	0.88 (0.25)	0.74 (0.33)	0.80 (0.31)
Educational attainment (0-18)	11.49 (2.46)	13.01 (2.37)	12.28 (2.14)	12.93 (2.62)	12.52 (2.46)
Employment status: working (yes=1)	0.53	0.55	0.69	0.38	0.54
Employment status: retired (yes=1)	0.25	0.24	0.13	0.35	0.24
Home ownership	0.92	0.96	0.98	0.93	0.95
Marital Status	0.77	0.86	0.94	0.71	0.80
Number of kids in household	0.65 (1.03)	0.80 (1.25)	0.74 (1.12)	0.67 (1.06)	0.72
Proximity to coast	5.40 (2.06)	5.44 (1.81)	4.92 (2.04)	5.68 (1.88)	5.36 (1.95)
White	0.27	0.44	0.27	0.40	0.35
Cajun	0.50	0.51	0.59	0.45	0.51
Female	0.34	0.52	0.26	0.45	0.40
Age	52.12 (16.59)	54.26 (15.38)	49.63 (15.00)	53.75 (18.46)	52.54 (16.43)
N	90	157	115	131	493

Table 16: Difference between regression coefficients Z scores for conditional models presented in Tables 11-14

	Model for fishing/seafood households			Model for oil/gas households		Model for Fishing/seafood & Oil/gas households
	Parallel models			Parallel models		Parallel model
	Oil/gas	Fishing/seafood & Oil/gas	Other	Fishing/seafood & Oil/gas	Other	Other
Change Over Time						
Wave 1: Oct 2010 (reference)						
Wave 2: Apr 2011	2.37	2.65	2.33	0.28	0.20	0.04
Wave 3: Apr 2012	1.73	2.23	1.27	0.61	0.38	0.93
Wave 4: Apr 2013	0.83	0.20	0.16	1.20	0.41	0.41
Resource: Energies						
Economic Impact	5.74	2.64	4.09	3.61	0.26	1.99
Disruption of everyday routines	5.05	1.21	2.04	4.53	1.05	1.09
Resource: Personal Characteristics						
Community attachment	0.21	1.10	1.21	1.05	0.10	2.57
Perceived distrust	1.92	0.28	0.16	1.87	1.87	0.12
Perceived blame	0.78	0.15	1.26	1.08	0.45	1.57
Control Variables						
Resource: Conditions and Objects						
Length of residence	1.79	0.19	0.63	1.71	3.12	0.90
Educational attainment (0-18)	0.65	2.70	0.86	2.37	0.17	3.94
Employment status: working (yes=1)	1.70	1.84	0.02	0.08	1.48	1.78
Employment status: retired (yes=1)	3.45	4.20	2.06	0.92	0.93	2.32
Home ownership	0.99	0.43	2.71	0.59	1.38	2.34
Marital Status	4.52	0.59	3.78	4.36	0.69	3.54
Additional Controls						
Number of kids in household	0.57	1.66	2.74	1.16	2.65	1.38
Proximity to coast	0.21	0.79	2.47	1.08	3.23	1.96
White	1.88	1.02	3.07	1.13	2.10	3.27
Cajun	1.20	0.30	3.84	0.98	0.01	0.94
Female	3.77	3.83	1.16	0.12	0.00	0.12
Age	1.52	0.25	3.50	1.97	1.65	3.66

Note: bolded Z scores denote a two-tailed significant difference

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Chapter 5: Conclusion

In the wake of the BP-DH oil spill, it is incumbent on social scientists to identify how the spill has impacted the people who live in the coastal region and to determine the contours of differential impacts across the social landscape. To date, social scientists have begun to examine issues such as, for example, mental and physical well-being, shifts in environmental views; community resilience, how changes to the environment will influence the outlook of children, risk perception, and public relations and image restoration strategies employed by BP which "did not attempt to shift the blame onto other companies nor admit responsibility on their own part."

The research presented in this dissertation assesses the social impacts of the 2010 BP-DH oil spill in South Louisiana. Underpinned with literatures that emphasizes the role of emplaced local community conditions for shaping ways in which people experience and interpret hazards, risks and disasters, this study focused specifically on the social vulnerability of residents of coastal communities in Southeast Louisiana which were directly affected by the BP-DH oil spill. At the outset, the aim of the project was threefold: 1) to identify the nature and extent by which the oil spill impacted residents' sentiment about their communities, 2) to investigate the variation in community level vulnerability and resilience in the wake of the disaster, and 3) to assess impacts to mental well-being tied to the loss of—or damage to—key resources upon which the victim is reliant.

The first article, "Crude on the Bayou: Impacts to Community Attitudes and Sentiments Following the BP Deepwater Horizon Oil Spill," addressed the nature and extent to which the oil spill impacted residents' sentiment about their communities. Scholars have argued that disasters should be conceptualized as a time-laden social process rather than as a singular event. As a social process, the ways a community responds to catastrophic disruption tend to differ insofar as the disaster process is viewed as 'natural' or 'man-made.' In a context with a natural disaster catalyst, it is argued that a "therapeutic community" is likely to emerge as people exhibit a high level of cohesiveness by providing mutual aid in response and recovery efforts. Conversely, technological disasters are said to bring about a community response rife with divisions and conflict. Such responses have been referred to as a "corrosive community." In this article, I utilized unique repeated cross-sectional household survey data to examine the social impacts of the 2010 BP-DH oil spill. Specifically, I analyzed four waves of the COSS collected between 2010 and 2013 to explore the nature and extent of how community attitudes and sentiments were impacted by the disaster. By conceptualizing community attitudes and sentiments in terms of the systemic model, greater variation in chronic corrosive social pathology is recognized following a technological disaster. Such considerations provided a broader sociological understanding regarding disaster catalysts, sense of community, social systems, and emergent "chronic corrosive processes."

The second article is titled "Emplaced Social Vulnerability to Technological Disasters: Southeast Louisiana and the BP Deepwater Horizon Oil Spill." In this article, I investigated variation in community level vulnerability and resilience in the wake of the disaster. Specifically, I examined the relationship between emplaced social vulnerability and impacts on mental health following the BP-DH oil spill. Analysts have argued that disaster vulnerability is socially constructed, arising out of the economic and social conditions of everyday life. As such, policy makers, emergency planners, and response organizations are encouraged to identify high risk communities for the purpose of aggressively developing effective disaster management strategies. Through joint analysis of data from the COSS and U.S. Census Bureau products, I developed a place-based index of social vulnerability to examine how emplaced characteristics engender unique susceptibility to the BP-DH disaster, with a special focus on the influence of natural resource employment and community sentiment. I documented that negative mental health impacts were not uniform across communities characterized by different levels of social vulnerability. Specifically, the results show that in places identified with high levels of social vulnerability, the effectiveness of attributes associated with resilience were muted while the effect of vulnerability attributes were amplified. Thus, the study confirms that vulnerability is a multidimensional concept and highlights that susceptibility to disaster related disruptions is influenced by the social characteristics of people and places.

The third and final article, "Never Confuse a Single Impact with a Uniform Impact: Natural Resource Employment and Mental Health Impacts Following the BP Deepwater Horizon Disaster," assessed impacts to mental well-being associated with resource loss and natural resource employment. There is a long established relationship between experiencing a disaster and associated impacts to individual mental well-being For example, mental anguish may be tied to the loss of—or damage to—key resources upon which the victim is reliant. In such cases, individual response to and recovery from a disaster is an interpretive processes influenced by the community's relationship to that environment and the manner in which damage was inflicted on the environment. The findings further vindicate the importance of the considering disaster impacts not as something tied to a singular event *in* time, but rather as a part of a process that unfolds *over* time. Additionally, the results show that (1) disaster related resource loss contributes to social vulnerability, (2) community attachment represents a significant aspect of disaster resiliency, and (3) perceptions of recreancy (e.g., blame and distrust) is a potential hindrance to disaster recovery

Taken together, the research presented in this dissertation provided an empirical and theoretical assessment of how the BP-DH oil spill has differentially impacted the people who live in the coastal region of Southeast Louisiana. Specifically, this research highlights how the social attributes that characterize people and places influence disaster related vulnerability to disruption. Disaster mitigation planning has disproportionately focused on biophysical issues (e.g., offsetting the risk of a storm surge by building more fortified sea walls and levees). But given that the definition of risk, costs, and impacts of disasters—indeed what even qualifies as a disaster—is socially constructed, our study adds to the chorus of social scientists who have long argued that people and their communities have to be a central consideration in disaster planning. Furthermore, disaster planners need to recognize that different types of disasters are likely to have especially negative and long term consequences for certain types of people in affected areas. Specifically, planners should focus increased attention on the perceptions of who maintain unique ties to damaged or threatened resources and how they view institutional ability to act in behalf of the communities' best interest.

Vita

Michael Ray Cope was born and raised in Springville, Utah. In 2002, he graduated from the University of Utah with a Bachelor of Arts degree in Anthropology. He received a Master of Science degree in Sociology from Brigham Young University in 2008 and a Master of Arts degree Sociology from Louisiana State University in 2011. He expects to receive his Doctor of Philosophy in Sociology from Louisiana State University during the Spring 2015 commencement ceremony. Upon completion of his doctoral studies at Louisiana State University, Michael will be joining the faculty at Brigham Young University as an Assistant Professor. His research focuses on community sociology and social change, with emphasis on disasters and disruptions.